REGIONAL OFFICE FOR THE WESTERN PACIFIC
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REPORT ON THE SEMINAR ON MATERNAL AND CHILD NUTRITION

Manila, Philippines, 3-14 January 1962

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SEMINAR ON MATERNAL AND CHILD NUTRITION

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N O T E

The views expressed in this report are those of the advisers and participants at the seminar and do not necessarily reflect the policy of the World Health Organization.

This report has been prepared by the Regional Office for the Western Pacific of the World Health Organization for governments of Member countries in the Region and for those who participated in the Seminar on Maternal and Child Nutrition, Manila, 3-14 January 1962. A limited number of copies are available on request to persons officially or professionally concerned in this field of study.

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CHAPTER I

GENERAL ASPECTS - THE OPENING CEREMONY

The opening ceremony of the Seminar took place in the presence of a few invited guests, the participants, consultants and members of the Secretariat. The guests included Dr. Francisco Duque, Secretary of Health for the Philippines, Dr. Conrado Pascual, Director of the Food and Nutrition Center of the National Science Development Board of the Philippines, Dr. E. O. Carrasco, Professor of Nutrition in the Institute of Hygiene in Manila, Dr. F. Co Tui, representing the Chairman of the National Science Development Board, and Dr. Lloyd Florio, Chief, Health Division, Agency for International Development.

Dr. F.J. Dy, Director of Health Services, WHO Western Pacific Regional Office in opening the proceedings said,

"In the field of nutrition, the objective of WHO in this region is to encourage departments of health in taking an active part in safeguarding, and where necessary improving, nutritional standards in the interest of the health of the community. We believe that each country should make adequate provision for training health workers in the field of nutrition; nutrition sections should be established within departments of health; and departments of health should have sufficient influence on national policies concerned with the production, importation and distribution of foods.

"As you know WHO does not only deal with specific diseases; our objective is the improvement of health. There would be no point, for example, in saving children from malaria just to let them die of kwashiorkor."

Dr. Dy continued, "Just two years ago, the post of Nutrition Adviser was created for the first time in this Regional Office. About the same time, Nutrition Advisers were established in other regional offices of WHO. By 1960 the time had come to make special efforts to assist governments in establishing public health nutrition programmes. It seems now that this experiment was quite justified, and, as far as the Western Pacific is concerned, there will probably be increasing calls on WHO for assistance in the field of nutrition, and the office of Nutrition Adviser is to continue."

Dr. Dy thanked UNICEF for their co-operation and financial assistance in implementing the meeting.

MISS MANUELA MARAMBA representing the Food and Agriculture Organization of the United Nations drew attention to the sharing of responsibilities between WHO and FAO in the promotion of the welfare of mothers and children. Miss Maramba said, "It will be remembered that in 1945 when FAO was formed its purpose was to promote technical discussions and the exchange of information between member countries. In 1950 it was charged additionally with much responsibility for technical assistance. In 1959 it assumed responsibility for pre-investment surveys under the UN Special Fund. Today FAO has become a very big operational organisation, drawing its resources from the UN Special Fund, Technical Assistance, joint FAO-UNICEF projects, and the gigantic Freedom from Hunger Campaign. In the last conference of FAO

held in Rome in November 1961 a proposal under consideration was to make available one hundred million dollars for utilisation of food surpluses in the economic and social development of various countries.

"Under these ever-growing responsibilities FAO shares with its sister agencies many projects for the improvement of nutrition of mothers and children.

"It is our task in FAO, for example, to ensure that there is an ample supply of food of the right kind that would best answer the particular needs of the vulnerable groups. It is also our task to promote programmes so that the channelling of these foods will provide an opportunity for everyone to share them. And lately we have answered the challenge of maximising the utilisation of the world food supply thus reducing, if not altogether doing away with, hunger and starvation.

"The Director-General of FAO recently launched the Freedom from Hunger Campaign calling on all countries of the world to co-operate in overcoming hunger. Many countries have responded to the call. Australia, for example, has made available initially seven hundred and fifty thousand Australian pounds to support programmes under the Campaign specifically for her neighbour countries of Asia and the Far East. A "blue-print" of a project for "Extension of Educational Facilities in the South Pacific Region" calling for the establishment of a permanent regional training centre for community education has recently been completed using this Australian contribution. The Canadian Youth Red Cross has underwritten a programme of "Food Production" to be implemented by youngsters of Sudan. A religious group in Germany has made available to Nigeria some one and a half million dollars. In the Philippines, discussions are going on for a Freedom from Hunger Campaign project "More Fruits and Vegetables to improve Nutrition". This is in answer to the findings of the First Nutrition Survey covering Central Luzon, undertaken by the then Institute of Nutrition in co-operation with the National Economic Council.

"It will be noted from the few Freedom from Hunger Campaign projects mentioned that they cover a wide field of activity. They are mostly action projects many of which will directly result in food production although many are educational, and still others of a research nature, contributing indirectly but finally to increased food production. It is also interesting to note that there is no clear-cut line between the donor and the recipient countries. In fact most countries are donors and at the same time project implementors. Donors, too, are of many kinds, - member governments, private enterprises, individuals, civic groups, religious groups, and others. Recipients could be government organisations, schools, public and private, community groups - anything. There is only one factor governing Freedom from Hunger Campaign projects - they must aim to bring about freedom from hunger throughout the world.

"If during our deliberations in this Seminar, or after, thoughts crystalise along the line of the objective of the Freedom from Hunger Campaign in the maternal and child health or other fields, FAO will be prepared to pursue preliminary discussions with you, as individual countries, or on a regional basis."

MR. PAUL EDWARDS, UNICEF Country Representative in the Philippines pointed out that, "whilst milk is a byword in his agency," which began distribution of skimmed milk in all parts of the world in 1948, "UNICEF is not only interested in milk distribution, it is also concerned with the development of the resources of individual countries. Substantial assistance has been given to countries like Indonesia in the production of protein-rich foods, and in others, such as India, in the development of fresh milk plants."

"UNICEF is concerned with the health and survival of mothers and children; I would like to see effective development of programmes which would have a real impact on school and pre-school children. But whilst over the past years considerable efforts have been made, it seems that goals have been only half reached."

Mr. Edwards continued, "School and community gardens have been proposed to supplement food production, but they are not the answer. Major efforts to develop agricultural programmes are needed, and UNICEF would be sympathetic towards such projects. At the same time, of course, programmes involving children are of value insofar as they might affect the child's dietary habits in his later years."

DR. G.R. WADSWORTH, Nutrition Adviser, WHO Western Pacific Regional Office, in introducing the consultants, took the opportunity to review briefly the first two years' experience of WHO nutrition activities in the Region. He said, "The Nutrition Division of the World Health Organization has close associations with the Pacific region. The first Chief of the Division was Dr. F.W. Clements, who is at present working in the School of Public Health and Tropical Medicine in Sydney. He continues to serve the Organization from time to time as a consultant and in training WHO fellows. The present Chief, Dr. R.C. Burgess succeeded Dr. Clements and continues in the post up to the present time. Dr. Burgess established himself as an authority in public health nutrition through his work in the Institute for Medical Research in the Federation of Malaya. This famous Institute has contributed much during the sixty years of its existence to our knowledge of ill-health caused by inadequate diets, especially beriberi and anaemia. Important work has been done, and is still being done, in other centres in this region especially in Japan, the Philippines, Taiwan and Australia. In view of all this it is regrettable that governments in the Western Pacific are not calling more on international aid to develop public health nutrition programmes. This does not mean that there is no need for such programmes; so long as infants and children are ill and dying, and so long as hospitals are over-flowing with patients, no health administration can be satisfied with its performance in the field of preventive medicine in which nutrition should take a prominent position."

Dr. Wadsworth continued, "Hundreds of millions of kilograms of milk powder are being distributed throughout the developing countries of the world. Nearly all the countries in the Western Pacific receive milk powder from UNICEF and other sources. But often it seems that once an administration has started a milk distribution scheme, interest in nutrition programmes ceases. In preparation for this Seminar we have been reading the interesting report "Dry Skim Milk Distribution", wherein it is clearly emphasised that the use of skim milk powder is only a temporary measure, and that it should be

associated with "nutrition education and other activities to encourage lasting improvements in nutrition." How many recipient countries in this region have accepted this challenge when they have signed agreements with UNICEF, for example, for obtaining supplies of milk powder? Failure to do so seems to be due to two things:

(a) A lack of co-operation between health, agriculture, economics and other administrations. That is to say, a failure of members of separate departments to sit down together to work out practical details of how to make sure that national food supplies are adequate, properly distributed and used by all classes of the community.

(b) A lack, in some instances almost complete, of interest on the part of doctors to enter the preventive, as opposed to the curative, services, and especially to take an interest in nutrition. This in turn seems to be due to the fact that there are very few training centres; it is my belief that a first step in overcoming the present situation - which in terms of the preservation of health, happiness and prosperity, is becoming increasingly urgent - should be the establishment within the Western Pacific Region of several first-class nutrition teaching and research centres."

PROFESSOR B.S. PLATT said that he was pleased and proud to be able to participate in the Seminar. "The subject is of vital importance to everyone; it is one that can be of fascinating and absorbing interest and I hope it will prove to be so to all the participants in the next few days - and for all of you for the rest of your lives - as indeed it is and I believe always will be for me."

"The details of the subject during the next few days may appear at times to be complicated and have bewildering ramifications. I want therefore at the outset to offer you a simple epitome of our subject in a short verse of a poem by Walter de la Mare, which goes like this:

'Tis a very strange thing,
As strange as can be,
That all that Miss T. eats,
Turns to Miss T.'

"This statement is of course true for Mr. T. - and for men and women everywhere. In order to produce healthy human beings there must be enough of the right kinds of food for them to eat - and I would like to emphasise the word enough. We have an old adage - 'enough is as good as a feast'. A physiologist friend of mine interested in nutrition prefers to say 'enough is better than a feast'.

"'Enough of the right kinds of food' - this was a dictum often used by Lord Boyd Orr, the first Director-General of the Food and Agriculture Organization, the sister body of WHO so far as food and nutrition are concerned. It means in more technical language having nutritionally adequate food supplies in relation to physiological needs - for the individual, the family, the community, the nation and for the population of the whole world.

"Given adequate resources of foods, or the means by which to obtain them and knowledge of how to use them to maintain health, there should be no malnutrition anywhere in the world. There are however certain complicating factors: notably the effects of infections, traumata, neoplasms and genetic abnormalities, which complicate this simple relationship between food supplies and food needs. We know, for example, that the rat infected with malarial parasites only retains for physiological purposes one-half of the protein utilised by non-infected rats offered the same diet. Nitrogen and electrolyte losses can be heavy following injury especially by burns and surgical operations. This phenomenon is recognised by surgeons, who, to their considerable credit, have contributed substantially to the understanding of these metabolic disturbances as well as to the methods of alleviating them. I would be the first to admit that there is still much to be learned about the phenomenon of disturbed nutrition; but we know so much nowadays that it can be said with confidence that there should be no malnutrition in the world today attributable to inadequacy of knowledge of the science of nutrition. Ignorance on the part of individuals - yes; on the part of parents, for example, and this, can, of course, be remedied by appropriate educational measures applied by properly trained persons. Parents can be taken as examples of 'those who have responsibility for the nutrition of others.'

"Because we are assembled here under the auspices of a United Nations Organization representing various countries we must look at this relationship between food supplies and human needs on the national scale. Parents may no longer be able to control the nutrition of their families. 'Those who have responsibility for the nutrition of others' include statesmen and others who should exercise their control through a national food policy planned in accordance with sound nutritional principles. If they do this, and if they ensure that the policy is implemented down to the individual consumer, they cannot fail to do a good, worthwhile and satisfying job. Those of us who are more immediately concerned with individuals can be frustrated and rendered ineffectual if we are not able to work within a framework of a sound, co-ordinated food, health, welfare and educational policy. On the other hand, given well-informed personnel, with good leadership, adequate resources for investigation and research we can help in the formulation of policy, take an active part in its application, and deal with the solutions of new problems which arise along with the development and advancement of a nation.

"I hope you will give some thought and consideration to these problems of applied nutrition - food supplies, food science and technology and related matters as well as to the nutritional factors directly related to the health of the mother and her young children.

"I said at the beginning how important I thought the subject of this Seminar is; I want to add a further reason for attaching significance to this particular Seminar, namely that it is the first one organised by WHO on a wholly nutritional topic to be held in this Region. I hope you will all conspire and co-operate to make it a success - in the next few days and in your jobs in the future. I arrived in the Far East and started work on nutrition in 1933 and I have seen in the past 30 years amazing and accelerated progress in the science of nutrition and its application. There are still exciting

tasks left to you. I trust this Seminar will help to define those tasks and give you guidance in doing them. I can assure you that there is an increasing recognition of the need for and value of applied nutrition work and that its prestige value is steadily improving; you can feel assured in the future that rewards, spiritual and material, will also improve and increase."

CHAPTER 2

THE PLANNING AND CONDUCT OF THE SEMINAR

History

In 1955 a seminar was organised jointly by WHO and FAO on the topic of education of the public in health and nutrition, and was held in Baguio in the Philippines.* Since then no seminar on nutrition has been organised by WHO in the Pacific region. The present meeting was approved by the Eleventh Session of the Western Pacific Regional Committee and by the Fourteenth World Health Assembly. Detailed plans were made in the Western Pacific Regional Office through a Planning Committee composed of members of the secretariat. In the later stages the two consultants were informed of developments, and immediately before the commencement of the meeting these consultants together with the Operational Officer drew up the final programme.

From the outset it had been agreed that the Seminar would be of an instructional nature, although care was taken to involve the participants as far as possible in the proceedings. The purposes and objectives were as follows:

(a) to describe and define the practical problems being met with in public health practice in the field of maternal and child nutrition;

(b) to study present knowledge about food and nutrition relevant to these problems;

(c) to consider effective means of educating mothers and other members of the family about adequate diets;

(d) to arrive at a conclusion about artificial feeding of infants in the light of present knowledge.

The meeting was conducted in English and French.

In view of the broad field involved much thought was given to the plan of the meeting so that discussions would be profitable and that useful conclusions might be reached within the short time available. A main factor in the improvement of nutrition is change in the food consumed and it was therefore decided to discuss food initially. Milk, as a natural food, not concocted by man, when available in adequate amounts and of good quality fulfils the infant's needs during the first few months of life. Thus the amount of human milk consumed by the infant provides a basis on which to discuss its dietary requirements. But in order to produce milk the mother must be adequately fed

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* Report of an International Seminar on Education in Health and Nutrition. Baguio, Philippines. 13 October - 3 November 1955.

not only during lactation, but also during pregnancy, and possibly even before pregnancy. Public health programmes to improve human nutrition must ultimately influence the production of adequate supplies of the right kinds of food. Food in itself, however, does not determine the supply of nutrients to the body and their utilisation; other factors such as the integrity of the digestive mechanism, and the transport of materials across the placenta, are also involved.

Bearing the above considerations in mind the plan of the Seminar as indicated below was evolved.

Participant preparation

The Seminar was designed to help not specialised nutritionists, but general public health workers, or those concerned with teaching such workers. Those who attended belonged to the following occupations:

Paediatrics
Public health nursing
Public health administration
Public health medical practice
Public health nutrition administration
University teaching (medical)
Public health teaching (nursing)
General medical practice
Medical nutrition, survey and research work

Details of participants, observers, consultants and secretariat staff are given in Annex 1.

It was realised that the kind of person attending the meeting might not have had adequate training in nutrition, and might not have realised the nature and importance of nutrition in relation to health. In order to prepare participants, therefore, literature was circulated to them about two months before the meeting commenced, and they were asked to study this. Details of this material are given in Annex 2. In addition, participants were asked to make certain enquiries and to give thought to the problems commonly being met with in everyday public health practice. A guide was prepared (see Annex 3) directing attention to the kind of problems having something to do with nutrition, and which might be discussed during the Seminar. Further, to encourage adequate preparation, each participant was invited to prepare a short paper to be presented in the meeting, and, where possible, to illustrate this by charts, projection slides, or other material. In the event some prepared detailed and comprehensive 'country reports' and others brought exhibits and official reports illustrating nutrition work in their respective territories. Owing to limited time only summaries of the longer reports were given in plenary sessions but opportunities were taken by participants to display graphs, tables and other material outside the official timetable. These informal sessions were approved by the Seminar and they occasioned a good deal of interest and exchange of views and information between individuals from different countries. Library facilities were also available, although few participants found time to make use of them. An activity not originally planned, but which arose directly from popular request was short sessions in which

consultants and others answered questions submitted in writing beforehand. The substance of these questions, answers and comments have been incorporated into appropriate parts of the report.

Reports prepared in written form by participants and submitted to the Secretariat are summarised:

A review of nutritional problems in Singapore

by Dr. Maggie Lim

Dr. Lim pointed out that foods of all kinds appear to be plentiful in the Territory, but because of poverty and other socio-economic conditions, malnutrition exists, and a good deal of sub-clinical malnutrition must account for ill-health among mothers and their young children. A particular problem in this sophisticated urban community is the influence of commercial advertising which often conflicts with the education of the public by health workers. This education work is also made difficult by the great demands on the time of clinic staff because of the rapidly growing size of the infant population, and because they have to deal with curative as well as preventive work.

The contribution of the graduate midwife to the teaching of nutrition in the field of maternal and child health in Vietnam

by Miss Tran-Thi-Phong

In view of the early stage of development of preventive health services in the country the midwife rather than the doctor often undertakes a good deal of responsibility in educating and helping mothers in the clinics. The midwife has contributed greatly to the introduction of new ideas and the changing of old habits and beliefs detrimental to the health and development of the child, and she teaches good infant feeding practice.

Miss Tran said, "During pregnancy many mothers are afraid to eat nourishing food, believing that they will have a large baby leading to a difficult delivery, and from this stems the oft seen picture of the anaemic, malnourished, and tired pregnant woman."

Nutrition activities in Japan

by Dr. K. Tomabechi

Dr. Tomabechi gave an outline of the organisation of the national nutrition programme, drawing attention to the annual report, "Nutrition in Japan, 1961" published by the Ministry of Health and Welfare.

Systematic programmes to improve nutrition were started in Japan over sixty years ago, in the first instance in order to control outbreaks of beriberi which were then prevalent. Today over 800 government nutritionists are working in

health centres throughout the country, and nutrition activities are the responsibility of a Nutrition Section in the Ministry of Health and Welfare. An outstanding achievement of the administration is a continuous national dietary and clinical nutrition survey which is conducted among selected groups every May, August, November and February so that seasonal variations can be assessed.

Dr. Tomabechi quoted figures illustrating how there has been a progressive change for the better during the past fifteen years in food consumption and standards of health in Japan, much of which can be ascribed to the vigorous national nutrition programme of the Ministry of Health.

Growth and development of Japanese children

by Dr. H. Funakawa

There has been a definite increase in the average weight of Japanese children since the last war, and this is more marked in urban communities. The mean body weight of young infants is greater in artificially fed infants than in breast-fed ones; but, a separate study has shown that artificial feeding carries with it a relatively high mortality rate. This may only partly be explained by the fact that relatively more premature and sick babies are fed artificially.

Review of nutritional problems in French Polynesia

by Dr. A. Cauret

Apart from gross dental caries and a high incidence of obesity observations in the Territory have not revealed obvious signs of malnutrition. However, owing to the division of the country into extremely numerous small islands scattered over a very wide area it is not possible to generalise. Even if nutritional standards are at present satisfactory, however, owing to the rapid growth of the population and economic trends the situation in the future may be unfavourable, especially insofar as the people may have to rely more and more on traditional foods, the growth of which is being neglected at present at the expense of using imported sophisticated food products.

Some thoughts on maternal and infant nutrition in Vietnam

by Dr. Nguyen-Lan-Dinh

After an extensive review Dr. Nguyen-Lan-Dinh concluded that the essence of the nutritional problem concerned with the mother and child is the persistence of old traditional feeding habits in conditions of marked social, economic, and political changes. Whilst mothers and infants are more vulnerable to inadequate diets, they are also the groups which can most be influenced by attempts to improve standards of health.

Anaemia in Korean infants during the weaning period

by Dr. Chang Yee Hong

The incidence of anaemia in infants is apparently relatively high and may be associated with prolongation of breast-feeding. In a special investigation it was found that the haemoglobin concentration in the blood of infants fed a mixed diet supplemented with iron was over 2gm./100ml. higher than that of infants entirely breast-fed.

Nutrition problems in a health region in the Philippines

by Miss L. Cadayona

The region concerned is largely populated by Muslims who for religious reasons do not consume pork, and who undergo fasting from time to time. Pregnant and lactating women, however, are exempted from fasting. Muslim and other sections of the community are influenced by traditional beliefs about foods, Much emphasis is placed on nutrition education, and village 'hilots' (traditional midwives) are trained by instructors who use actual foods locally available for teaching purposes. The hilots in their turn try to teach village mothers better food habits.

Dietary habits during the puerperium and early infancy in Malaya

by Mrs. G. Paranjothy

All races in Malaya firmly believe that food with a 'heating' effect should be consumed during the puerperium, and those with a 'cooling' effect avoided; thus, many vegetables and fruits are excluded from the diet. Malay women observe a period of forty-four days after delivery during which their diet is restricted almost entirely to rice with a little salted fish.

Many Malay and Chinese mothers give honey as a laxative to the newborn. Both Chinese and Malays introduce foods other than milk quite early to the diet of the infant, but Indian mothers are much more cautious in this respect.

Cantonese dietary pattern in Hong Kong

by Dr. Sylvia Chui Chan

The outstanding features of Hong Kong are its very limited agricultural potential, and the enormous increase in population since the last war. In spite of these difficulties standards of health have markedly improved, and the incidence of specific nutritional deficiencies have been greatly reduced. This is particularly so in the case of beriberi which accounted for 563 deaths in hospital in 1953, but only 10 deaths in 1960.

Little attention is given by the Chinese to the diet of the pregnant women, but there are some food 'taboos' during this time. This may account for relatively low haemoglobin levels recorded in ante-natal clinics in Hong Kong.

During the first month after delivery much attention is given to the mother's diet and in addition to chicken and other nutritious foods, use is made of special preparations containing vinegar, which ensures the ingestion of iron and calcium in considerable amounts.

Maternal and child nutrition in the Philippines

by Dr. J. Barrios-Balea

Beriberi is reported to account for 12.6 deaths among every 1000 live births, and is the most common cause of infant mortality. Beriberi is also commonly reported among pregnant and lactating women.

A good deal of nutrition education of the public is attempted, but many difficulties are encountered inclu ing a high proportion of the public who do not seem interested. One of the most frequent causes of failure of people to use a good diet is lack of sufficient money to buy enough food.

Dietary habits of mothers and infants in the Philippines

by Dr. A. Vergara-Valenzuela

A preliminary analysis was given of an enquiry by questionnaire conducted in two areas near Manila. The subjects of the study belonged to the lower social classes. An appreciable number of mothers abstained from certain foods during pregnancy and lactation; and a high proportion thought that special foods including fruit, beans and meat should be taken at these times. Two out of 77 mothers said that they had completely failed to lactate. For artificial feeding, evaporated cows milk was used in 43 per cent of the cases and 'filled milk' in 15 per cent.

A visit to the Baliem Valley in Central New Guinea

by Miss G. B. Bartels

The people of the valley have remained isolated and 'stone-age' implements are still used. The staple food is sago; and during pregnancy and lactation some kinds of fish and vegetables are not allowed in the women's diet. The baby is put to the breast from birth, and after the first day pork fat is given as a supplement.

Maternal and child nutrition in Korea

by Dr. Duk-Jin Yun

Owing to lack of transport and storage facilities in Korea agricultural and sea foods are only available according to season. A survey has demonstrated that there is a marked seasonal variation in availability of various nutrients. Education of the public is attempted in numerous ways, for example by special radio programmes and through newspaper articles.

Of interest are enquiries into the incidence of rickets in Korea; this is sometimes high and depends upon the season during which enquiries are made.

Some observations on pregnant mothers and infants attending health stations in Taiwan

by Dr. Peng Jui-yun

Very few mothers are seen during the first four months of pregnancy, and just over one-quarter are only seen at full-term, so that opportunities for effective nutrition education are limited. Anaemia is often found, over 5 per cent of pregnant women having haemoglobin less than 60 per cent (Haldane scale). An indication of poor nutrition is that only a small increase in body weight is sometimes found during pregnancy, and occasionally the mother loses weight.

Over half the infants are given mixed feeding only after one year of age, and breast feeding is sometimes prolonged for two years or more. The average weight of Chinese infants is about the same as that of London infants until six months of age, after which it is less, owing to a slower rate of growth.

Supplementary feeding of infants observed in Taichung, Taiwan

by Miss Ao Man-mei

An enquiry was made among 211 mothers and their infants of the addition of foods other than breast milk to the child's diet. Foods were of a wide variety including fruit, fish, vegetables, eggs and certain proprietary preparations such as multi-vitamins. Items were introduced in some instances from the earliest age. The mothers came from different educational levels over half having no formal education; about 8 per cent had a high-school training. The mothers had gained their knowledge about infant feeding from public health nurses in nearly 70 per cent of cases, others from family members and neighbours, and only very few from doctors or magazines. Failure to use supplementary foods was ascribed most commonly to ignorance, less often to lack of time or reluctance to take trouble. In a few instances supplements were not used because of the opinion of grandparents.

Some food habits of mothers and children in Taichung, Taiwan

by Dr. T. S. Chen

Many foods may be prohibited to pregnant women including leeks, noodles, black beans, fish and pork fat. The enquiry on which these observations were based revealed that about 45 per cent of the women had no dietary prohibitions. Prohibition of one food or another was however almost universal during the puerperium, but to a less extent during the lactation period. Such restraints were influenced by the subject's mother or mother-in-law in about one-quarter of the cases, but most often the subject herself made the decision. In some instances particular foods were avoided because of taste, but usually it was allied to a belief that harm would result to the mother or her child. In contrast particular foods were taken by some women in the belief that they would give good results such as better nutrition, helping the baby to grow and preventing illness.

Conduct of the Seminar

The proceedings were conducted in four main topics: (1) nutrition of infants and young children; (2) maternal nutrition; (3) pathogenesis of malnutrition and recognition of nutritional ill-health; (4) nutrition education and training. Each topic was subdivided as indicated in the account given later on.

Each main topic was introduced by talks in plenary sessions followed by discussions in small groups of participants. One or more members of the Secretariat or other resource persons were allocated to a particular group; consultants were free to move among groups. Each group elected a chairman and a recorder for each topic. Grouping was determined beforehand by the planning committee taking account of a balance of interests of individuals, interpretation facilities, and the avoidance of having participants from one country in the same group. Guide-lines were provided to help them reach useful conclusions. Group reports on each topic were submitted and debated in plenary session. On the last day of the Seminar all the group reports were reviewed by the discussion groups and then by the chairmen and rapporteurs for each of the four topics. The chairmanship of plenary sessions was shared between the consultants and the operational officer. The timetable (Annex 4) shows the spacing and relative time devoted to various parts of the proceedings.

Throughout the meeting films were shown at the end of the day, and teaching aids, food samples and other display material were exhibited during the recesses for lunch. This exhibition was additional to a larger one prepared by Miss Burne. The purpose of the films and other exhibits was to provide participants with information and also to form a basis for technical discussions on the use of such aids for scientific, teaching and propaganda purposes. In order to make the fullest use of these materials a 'film group' and an 'exhibits group' were convened, each having a special consultant and one member from each of the seminar topic discussion groups. The consultants advised their respective groups of the points to be considered in assessing the value of a film or exhibit, and each of these special groups prepared a report which was presented and discussed in plenary session. In addition each member of the two special groups discussed films or exhibits with the remainder of the seminar topic group to which he belonged. The film member served as chairman and the exhibit member as reporter for topic 4 group discussions, films and exhibits being relevant to education and training.

The progress of the Seminar was guided through a 'steering committee' which met daily. This committee consisted of the two consultants, the operational officer, the resource personnel, and the chairman and recorder from each of the three discussion groups; the latter members being changed according to the topic under discussion at the time. All participants sat on the steering committee at some time during the meeting and everyone had an opportunity to express their views on the organisation and course of the proceedings.

The overall plan for the Seminar was left in draft form and not issued to participants, although it was available to the steering committee. One duty of the steering committee was to finalise at each meeting the programme for the following day. This was then issued as a bulletin which contained other details such as the guide-lines for discussion groups. Examples of these daily bulletins

are given in Annex 5. In this way interest was sustained, and confusion resulting from modification of the original plan arising during the course of the Seminar was avoided.

The afternoon preceding the closing sessions of the Seminar was used in allowing participants to visit the Philippine Women's University and health centres in Manila; this was appreciated by the participants and gave the Secretariat an opportunity to compose summary group discussion reports, copies of which were distributed to the participants in time for their perusal before the Seminar ended.

Evaluation

Comments were invited from the participants regarding the conduct of the Seminar and for suggestions. A stereotyped form was not issued in the belief that more spontaneous comments would be of greater significance. Guide-lines, however, were issued. This evaluation of the meeting was carried out in group discussions from which consultants and Secretariat were absent, and an evaluation report was consolidated by two of the participants. The following brings out the main points and includes comments recorded during the Seminar.

a. Literature: was adequate and interesting, and its distribution before the commencement of the Seminar was appreciated;

b. Questionnaire: was comprehensive and useful not only for preparing material for the meeting, but as a guide for future enquiries;

c. Objectives: were well defined, and well fitted to the type of participants involved;

d. Material: the material presented in the meeting gave a good insight into new knowledge in nutrition, and participants felt that they had learned a great deal and that it should prove useful in future work.

The efforts of participants in displaying and discussing exhibits was appreciated and aroused interest; exhibits from participants should be encouraged in future seminars. The display of statistical tables was found useful in giving comparisons and promoting discussion. Displays could have been made more attractive by fuller use of colour; photographs should be sufficiently large with short and accurate captions. The display of actual foods by one country which the public could see and taste was commended.

e. Conduct of the meeting:

Synopses of country reports would have been appreciated before the presentation; and an epidiascope would have been useful in presenting tables and graphs.

The timetable was crowded, and did not allow time to read reference material especially as individual copies were few in number. Some participants would have liked to have the programme sooner than was the case.

The involvement of a special speaker at one of the sessions was much appreciated; and invitations to specialists who may be available locally to take part in such seminars is to be encouraged.

The participants were impressed with the importance of the consultants in the seminar and they much appreciated the services of the resource personnel and their helpful attitude.

F. Follow-up activities:

i. Distribution of information about new work and publications would be appreciated.

ii. There should be a follow-up seminar after two to three years.

iii. Participants should create interest in nutrition among various groups in their own countries.

CHAPTER 3

NUTRITION OF INFANTS AND YOUNG CHILDREN

Human milk

A final objective of nutrition research is to discover the ideal diet suited to particular physiological needs. Diets at present used by man are extremely varied, and are dictated largely by availability of foods. Study of the foods consumed by animals in the wild state might be worthwhile because they wander about by instinct until they find materials which, presumably, their bodies require. An instance of this is the long journeys made by animals in some parts of the world in search of salt, and, of course, water. Furthermore wild animals do not graze given areas to an extent which leads to a change in ecology, but move about so that a balance of animal and vegetable life is preserved. Perhaps careful study of dietary consumption of wild animals and their state of health could provide basic information about normal nutrition. But even in wild life circumstances must often interfere with the ingestion of food to meet physiological requirements. The egg is a special mixture adequate for the dietary requirements of the embryo bird, and here again study of the relationship between metabolism, development and the nature of the egg components should be rewarding. Perhaps, however, milk is the most important example of a complex dietary mixture designed to meet certain normal nutritional needs, especially as in the form of human milk it may be related directly to the human subject at least at one stage of life. From the point of view of providing information on the nature and composition of an adequate and balanced diet the breast milk taken by the human infant is therefore of special interest.

Milks are not haphazard mixtures, but consist of many constituents which differ quite markedly in proportion according to the species (Annex 6) and the stage of lactation. Apart from absolute differences in the concentration of various constituents in milk of different animals the relative amounts of one to

another is also of importance. The best known example is that relating to calcium. Cow's milk contains four times as much calcium as human milk, but sometimes human babies fed on cow's milk develop hypocalcaemic tetany. The reason for this seems to be a high concentration of phosphate in cow's milk. Human milk contains about twice as much calcium as phosphorus, whereas cow's milk contains only slightly more calcium than phosphorus. Tetany develops when the concentration of calcium in the blood falls below a critical level, and the higher the serum phosphate the lower the serum calcium. Thus an infant fed on cow's milk may have a relatively high concentration of phosphate in the serum with a corresponding depression of the calcium level. This effect is aggravated in early life because the kidney of the newborn infant is unable to excrete phosphate efficiently and this chemical may accumulate in the blood.

The quality of human milk

Much has yet to be learned about the composition of human milk, for example the significance of the presence of enzymes, and of the extent to which variations in composition can be regarded as normal. Observations on human milk suggest that its quality may be maintained in spite of poor nutrition of the mother, although this may not be true for some vitamins. The vitamin concentration in human milk can be influenced directly by the mother's diet, for example in the case of ascorbic acid and of thiamine, but the significance of this for the infant is by no means certain. In the absence of accurate information about this phenomenon, the practice, widespread in some countries, of instructing mothers to supplement their infants' diet with citrus fruit juice is open to question.

Variation in the thiamine content of human milk is of particular importance in view of the seriously high incidence of infantile beriberi suspected in some parts of the Western Pacific Region. It is generally believed that the condition is not simply due to a deficiency of thiamine in the diet of the child, but also to the ingestion of abnormal metabolites appearing in human milk when the mother's diet is deficient in thiamine. The thiamine content of human milk is influenced to some extent by the dietary supply of the vitamin, although there is still insufficient information to reveal exact correlations with the occurence of infantile beriberi. The results of a recent enquiry were presented in the Seminar; and these were in agreement with average figures published by previous investigators. On the average human milk contains 11mg./100ml. of thiamine, but there is a wide range, and maximal concentrations are not attained until the fourth week of lactation.

It is an old observation that in cattle the amount of iron in the milk is independent of that in the diet, and there is some evidence that this is so in humans. This raises the question of the advisability of giving young infants iron supplements, because although the concentration of the element in milk is indeed low it seems to be fixed at a physidogical level, and any greater intake by the infant is possibly undesirable. Delayed onset of menstruation after delivery in poorly nourished mothers, and even in others not obviously malnourished, may have significance in conserving iron in the mother's body and in her milk.

There is evidence that changes which may well have significance in relation to infant nutrition may occur in human milk according to the mother's diet, but such changes await full exploration. Observations were made over fifty years ago

strum

In some respects colostrum is a concentrated form of milk so that for unit
ne it contains, for example, more sodium, iron and protein than mature milk
ex 6). Nothing is known of the peculiar absolute and relative concentrations
ne constituents of colostrum, but it is reasonable to suppose that they are
ignificance in relation to the physiological requirements of the newborn child.

Colostrum is a source of the bifidus factor which is important in determining
nature of the intestinal flora. In addition it is a source of antibodies
uced actively in the body of the mother, for example an anti-poliomyelitis
body. There is a variation in the route by which antibodies are conveyed
the mother to her young according to the species. In the human the most
rtant route seems to be through the placenta, but colostrum may also be an
rtant vehicle.

Colostrum contains blood group antibodies, but in too dilute a concentration
e of practical significance.

In a number of communities colostrum is considered an undesirable product
is witheld from the infant. But in spite of inadequacy of available scienti-
knowledge the Seminar was of the opinion that the use of colostrum by mothers
ld be encouraged by health workers. This also has the advantage that the
ciated early suckling stimulates mammary gland activity.

titutes for human milk

For one reason or another some babies are not fed from the breast and
titutes must be used. Apart from the fact that no other animal milk and
ther food mixture is even approximately the same in detailed composition as
n milk, the use of substitutes raises three main problems:

(a) The formula may be too dilute so that the infant, being limited in the
me that it can ingest, suffers from undernutrition.

(b) The formula may be too concentrated; different kinds of foods provide
erent kinds and amounts of metabolic end-products which have to be excreted
ugh the kidney. In order that this excretion can be achieved sufficient water
be available, because the kidney can only deal with solutions below a certain
entration. The kidney of the newborn is not so efficient at excreting waste
rial as that of the adult, and the question of adequate amounts of water for
etion is relatively more critical. If excretion does not take place waste
ucts accumulate in the body and may exert dangerous effects, including a
urbance of the electrolyte balance. Some babies become 'bottle-shy' and this
be an instinctive defence against ingestion of too strong a food mixture.

(c) Perhaps the most directly serious hazard of using artificial feeding
nfection. "The feeding bottle can be regarded with exaggeration as a lethal
on ...." (Jelliffe, p. 24); and the increasing use of bottle-feeding may lead
situation in which "it is entirely possible that the nutritional status of
children in the tropics, far from improving, may be worse in the next
de than previously" (ibid, p. 27). The Seminar agreed that there is no
ence to refute this strong argument, and there is everything to be said for
whole-hearted encouragement by health workers of breast feeding.

that when poor women were given a nutritious diet the amount of fat in their m increased and their infants gained weight more rapidly. The question of huma milk fat, however, is only now being investigated in detail. Of interest is t observation that fatty acid composition of milk fat seems to depend on the mot energy metabolism, and how far she is using up reserve stores of body fat. A further example of an hitherto unsuspected influence of the mother's state of nutrition on the quality of milk is in respect to the ratio of curd to whey pr tein. In malnourished mothers there is relatively more curd protein, and this should be considered in relation to the behaviour of food in the infant stomac

Of great interest, and of possible importance, are the observations made rats that ingestion of certain extracts of botanical origin (genera Senecio, Crotalaria, Heliotropium, Trichodesma and Echium) by the mother leads to the appearance in her milk of chemicals poisonous to the young. The latter, even after minimal doses of the extracts to the mother, may suffer damage to the li developing possibly, in later life, into cirrhosis or carcinoma. Herbal remed are widely used in the Pacific region, and liver disease is common, in some communities markedly so, so that enquiries in this field seem highly desirable

The quantity of milk secretion

Sometimes poor nutritional status of the mother may be associated with an ability to produce copious amounts of milk, but as in the case of quality of milk present information is far too scanty and conflicting. If the breast-fed infant is gaining weight satisfactorily the maternal milk supply is adequate i spite of what the mother or her relatives may say to the contrary. One diffic in this connection is the loss of weight commonly encountered during the first few days of life. No conclusion could be reached by the Seminar as to whether such weight loss is normal. Attention was drawn to published observations whi related weight loss in young infants to excretion of hormones in the urine, th investigators concluding that weight loss was due to loss of body water. One participant described his own observations in which loss of weight was greater than that which could be accounted for by excretion of urine and meconium. It was generally agreed that food intake is frequently purposely restricted durin the first few days of life, and this would clearly account for loss of body weight. The Seminar concluded that there is a need to investigate carefully weight changes in the newborn infant because body weight is an important index of nutritional status at this critical stage of life.

The volume of milk taken from the mother by the infant depends upon its size, and it can be calculated that increments in weight gain, and thus of mil consumption, are proportionately more or less constant whatever the size of the child. Thus small babies grow at the same rate as large babies, but on a different plane. It is reasonable to suppose that body size, growth rate, and volume of milk ingested are co-ordinated so that the infant's digestive abilit dictated by the size and stage of development of the digestive system, is not over-taxed. This possibility suggests that attempts to increase the size of a infant by supplementing breast feeds might be undesirable.

Foods which are used in place of the mother's milk for infant feeding common to all areas are sweetened condensed milk, evaporated milk, powdered milk, fresh cow's milk, goat's milk, milk from the wet nurse, rice-water and barley water. Sweetened condensed milk is of special interest because it is so widely used. This is probably due to the fact that it has been available for a very long time and is therefore well-known, to its excellent keeping properties, and to its availability in amounts cheap enough to be bought by poor people. It was pointed out that sweetened condensed milk is not really a cheap food; whilst a standard small packet of milk powder costs about twice as much as a small tin of sweetened condensed milk, when properly re-constituted the former yields about four times as much food. Unfortunately powdered milk is not always available to the public in sufficiently small packages. Other reasons suggested against the use of sweetened condensed milk are its high concentration of sugar, which infants appear not to digest as well as starch, and the taste for it which the infant readily acquires at the expense of that for more nutritious foods. The Seminar concluded that the use of this milk product should be discouraged by health workers.

The use of goat's milk raises the question of 'goat milk anaemia' which has been known for a long time and which might be due to the very low concentration of vitamin B_{12} in this food. A participant described an enquiry into the cause of goat's milk anaemia in his country; the results suggested that factors other than the milk were involved such as infection. In another country observations had not confirmed the theoretical hazard of Malta fever arising as a result of the use of goat's milk. The Seminar was of the opinion that goat's milk can be useful for infant feeding.

'Filled milk', that is skim milk powder reconstituted with water and a vegetable oil, has fairly recently appeared on the market. An enquiry in one country where this product is widely available had shown that an appreciable number of infants were being fed on filled milk in place of breast milk, and it is even more commonly given as a supplement. In connection with this and other commercial preparations used for infant feeding participants expressed the opinion that information given on the labels is inadequate so that the public is not fully aware of the composition of various preparations. Furthermore, the public is now being influenced by intensive commercial advertising, which is sometimes finding its way into health centres. Some participants believed that whilst some advertising is being directed at doctors and nurses, they are usually well enough informed to be able to judge for themselves the merits of various foods offered for sale to the public. The opinion was expressed that there is too little money available in public funds to allow adequate education of the public as a corrective to commercial advertising.

There are various reasons why some mothers resort to artificial feeding of their infants. Sometimes, in spite of a desire to do so, they are unable to produce milk, and perhaps traditional food prohibitions may be implicated in this; in others there is an unwillingness to feed the infant; among the poor the need for the mother to leave home in order to work interferes with breast feeding. One participant pointed out that in his country provision is made in some instances for factory workers to feed their infants at intervals during working hours, and seasonal day-nurseries are organised in farming and fishing

communities to take care of young infants during busy harvest seasons. The Seminar agreed that the setting up of day-nurseries in factories is a necessity, and it is important to admit mothers to hospital along with sick infants. At the same time it was recognised that in the latter case there are practical difficulties such as lack of ward accommodation, and the need to employ home help to take care of the rest of the family during the mother's absence.

A further reason why many mothers in the East are now using artificial feeding is because they have become aware of this practice in the West, apparently resulting in no untoward effects.

Mixed feeding

The practice of giving infants even from the earliest age foods other than milk is apparently universal. The kinds of food used are influenced by their physical consistency, cost and local traditional beliefs. In most areas, especially among the poor, supplements consist of such items as rice-soup, coconut pulp, vegetables, egg and fruits; among the wealthy, proprietary cereal foods are now commonly used. Where foods have to be purchased, expenditure of money on jewellry and education sometimes take priority over the buying of nutritious and suitable foods.

Health workers usually give advice about the introduction to the infant's diet of such things as egg yolk, mashed vegetables, fish and minced or pounded meat. The main reasons why this advice is not always followed are:

(a) the family is unable to afford the foods;

(b) the mother is too busy to be able to make special preparations for the infant, or to spare time to spoon feed him;

(c) the mother may fear that the baby will not be able to tolerate the additional foods at an early age.

The Seminar thought that there is a need for more investigation of diets based on local products and of the best balance between protein, fat and carbohydrate. Investigations in this field would require the co-operative efforts of food technologists, paediatricians, and nutrition laboratory workers.

CHAPTER 4

NUTRITION OF THE MOTHER

1. The physiology of pregnancy

During pregnancy changes occur in the metabolic state of the mother associated with the growth of the uterus, placenta and breast tissue, and lead to variations from the non-pregnant state in the levels of various blood constituents. The blood levels peculiar to pregnancy are probably significant in relation to both the maternal and foetal requirements. The nutrients which

the foetus receives depends on the composition of the maternal blood and only indirectly on the quality and quantity of food ingested by the mother. Foetal nutrition also depends upon the permeability of the placenta, and on the blood flow through the uterus.

The placenta is an important and complex organ and functions as an endocrine gland. It has a selective action in allowing substances from the maternal blood to reach the foetus. Three groups of substances can be recognised in relation to the placental barrier: (a) those that pass across freely; (b) those that cross against a concentration gradient; and (c) those that do not normally pass at all. Although little is known of the significance of the interrelationship between maternal blood levels of specific nutrients, the barrier function of the placenta, and the normal growth and development of the foetus, it may be assumed that there is a normal pattern, departures from which may be harmful. Some blood constituents, for example carotene, increase markedly in concentration in the maternal blood during pregnancy, and this is perhaps necessary to ensure a normal transfer to the foetus. But one participant drew attention to results of an investigation in her country which failed to reveal increased plasma carotene levels in pregnancy, although no untoward effects have been noticed in infants born in the community concerned.

In view of the prevalence of anaemia in infants and possibly also in later life, and of the importance of defective tissue iron reserves in its aetiology, the question of transfer of iron to the foetus is of importance. It is of interest that there is experimental evidence that placental transfer of iron is impeded in the presence of infection. In a study of human material it has been shown that the iron content of the foetal liver increases rapidly with growth, but the amount of iron in infants of birth weight less than five pounds is small; and the amount progressively increases up to about tenfold as the birth weight exceeds five pounds. The total storage iron in adult men has been estimated as 11 mg. per kg. body weight, whereas in an infant weighing six pounds at birth 27mg. per kg. body weight is accounted for by the amount in the liver alone. Thus the latter part of pregnancy is an important period for the elaboration of iron stores in the foetus which normally is born with a relatively high concentration of stored iron. Failure to establish such reserves may provide the basis for the development of iron deficiency anaemia later in life.

The fact that certain substances present in maternal blood do not normally pass over to the foetus suggests that such substances may be harmful to it. In this connection the possible danger of increasing maternal blood concentrations of hormones was mentioned. Recent work has shown that some hormones administered to the mother pass over to the foetus and cause abnormal development of the primitive foetal breast tissue. Other work suggests a similar aetiology for other congenital malformations. The potential danger of hormone therapy for amenorrhoea not recognised as due to early pregnancy is apparent.

One of the best-known changes in the blood during pregnancy is a fall from normal levels of haemoglobin concentration. It is well-known that this fall is due to an increase in the total plasma volume and not to a true anaemia. This haemodilution is important in relation to blood flow in the body of the pregnant woman. The total volume of blood is appreciably increased in pregnancy in

association with the greatly increased vascularity of the pelvic tissues and the breasts. In order that the work of the heart should not be increased haemodilution is advantageous because the lower the haemoglobin level the less the blood viscosity and the easier it is to pump it through the vascular network.

Preservation of a satisfactory blood flow through the uterus and placenta is presumably important in maintaining adequate supplies of nutrients to the foetus, and for this reason physiological haemodilution is also important. It is of interest that measurements on human subjects have shown that the normal blood flow of about 600 ml. a minute through the placenta is reduced to about 200ml. in toxaemia. Such a reduced blood-flow leading to an inadequate supply of nutrients may be significant in causing the relatively high frequency of foetal deaths and congenital malformations in toxaemic pregnancies.

In well-nourished communities women gain weight during pregnancy, and this can largely be accounted for by the increased blood volume and the growth of the uterus, placenta, foetus and breasts. But, sometimes maternal weight gains may be small, and occasionally weight may be lost. Investigations of body composition suggest that during pregnancy there may be an increase in one body component at the expense of another, so that the significance of weight changes during pregnancy from the point of view of maternal and foetal nutrition is probably not straightforward. On the average, however, the Seminar agreed that inadequate nutrition of the mother, often revealed by a failure to gain weight during pregnancy was hazardous, and poor nutritional status in a community is associated with relatively high frequency of premature births and of infants of low birth weight. Such infants are relatively vulnerable to environmental influences, and may remain at a disadvantage physically throughout life.

Several participants mentioned the traditional practice of dietary restriction by the pregnant mother and that attempts should be made by health workers to change this. It is also the custom sometimes to give the best part of the meal to the husband first, then to the children, and last to the mother. The mother's diet might also be restricted for other reasons including religious beliefs, and the lack of time to obtain a good meal during the day when she is engaged in manual work. The health worker must endeavour to remedy such conditions through education of the public.

2. The physiology of lactation

The first sign of mammary gland development is seen in the human foetus at an extremely early stage; and at birth the simple glandular structure is capable of secreting milk ("witch's milk"). At puberty there is a great increase in the development of the gland. It is of interest that the growth and ramification of the tubular glands seem to be related to the amount of adipose tissue present in the breast. In the presence of much fat, mammary gland growth seems to be impeded. Excessively rapid growth and adiposity at puberty has become a problem in many communities, and raises the question of whether future lactation performance may be impaired as a result.

With pregnancy marked changes occur in the mammary gland leading to marked vascularity easily seen in later pregnancy in the form of enlargement of the superficial veins over the breast, and to a proliferation of the glandular tissue from which secretory material can be expressed. Soon after delivery active secretion of colostrum begins, followed by the production of milk.

Attention was drawn to a special feature of the mammary gland structure, namely, the network of contractile fibres which surround in basket-like fashion the separate alveoli.

Much experimental work had now established that lactation is dependent upon the pituitary gland. When the pituitary gland is surgically removed from experimental animals during lactation the young stop growing due to the subsequent lack of milk secretion. Other experiments have shown that the pituitary gland itself is under the influence of that part of the brain lying in its immediate proximity, the hypothalamus. The hypothalamus is connected by nerve pathways not only directly with the whole of the sympathetic and parasympathetic nervous systems, but also with other parts of the brain including the cerebral cortex. There is, therefore, an adequate structural and functional basis to explain psychological influence on lactation performance.

The anterior part of the pituitary gland secretes a number of specific hormones which exert powerful effects on growth and on the thyroid and suprarenal glands and other organs. The posterior pituitary secretes two substances, namely pitressin and oxytocin. According to present scientific knowledge it seems that when the nipples and areolar areas of the breasts are stimulated by sucking, nervous impulses ascend to the hypothalamic region of the brain from whence further impulses pass to the posterior pituitary. The latter then begins to secrete pitressin and oxytocin which pass quickly round the whole body in the blood stream. Oxytocin arriving in the breast causes contraction of the fibres which surround the alveoli thus propelling the milk forwards into the dilated parts of the mammary ducts which lie just beneath the nipple. Filling of these cisterns enables the infant to express milk through the duct openings by compression of the areolar area. One important factor is the ability of the child to take into its mouth sufficient of the areolar part of the breast. Breasts which are rounded, rather than elongated, and which are too firm because of engorgement or the presence of too much fat in their structure, may not allow successful application of the mouth of the infant. Obstruction of the infant's nasal passages will also hinder sucking because of the need for breathing through the mouth. Thus mechanical factors such as these should always be looked for in cases of unsuccessful breast-feeding.

The effects of posterior pituitary secretion are wider than that on the breast, and include contraction of small blood vessels and uterine muscle. Breast-feeding, leading as it does to repeated pituitary activity, is probably important in bringing about involution of the uterus.

A good deal of time of health workers is occupied in teaching mothers pre-natal care of the breast, and in the method of holding the infant during breast-feeding. However, it is important to realise that successful lactation

is often possible when no special instruction is given to mothers, and it may be harmful to disturb traditional practices, even though they do not conform to methods regarded elsewhere as desirable, so long as the infant is thriving.

CHAPTER 5

INTERRELATIONSHIPS OF ILL-HEALTH AND MALNUTRITION

a. Pathogenesis of malnutrition

Following on the discussion of a balanced diet, as exemplified by human milk for young infants, and considerations of a method of expressing protein-calorie needs, as well as of protein-calorie values of food (Annex 7), a discourse was given on the effect on cells, tissues and the body as a whole when protein-calorie needs are not met. There is a broad spectrum of clinical manifestations of disease which can be classified as protein-calorie deficiency diseases, ranging from marasmus at one end to an acute fulminating condition known by many names, but probably best known as kwashiorkor. These two conditions have been reproduced in experimental animals, the first by under-feeding with a diet containing a low concentration of poor quality protein, the other by feeding the same diet but coaxing or force-feeding the animal with additional carbohydrate - a mixture of starch and sugar. The growth of the body as a whole is more or less retarded; changes have been demonstrated in all the tissues and organs of the body, e.g. in the endocrine part of the pancreas - the islets of Langerhans - and the liver cells. Reference has been made to changes in the mucosa of the gastrointestinal tract as a result of malnutrition and the relationship to diarrhoea. Bone and tooth formation is adversely influenced by diets unbalanced or inadequate with respect to protein and calories, so also is the composition of the carcass. A syndrom has recently been produced in puppies by feeding their mothers on protein-calorie deficient diets; this syndrom simulates that seen in some forms of cerebral palsy in children.

b. Metabolism and disease

Protein which, apart from water, is the most abundant substance in the human body, constitutes 11 per cent of the body weight. It forms the most important part of the soft tissues - muscle, blood cells, liver and other organs, and even hair and nails. Proteins also play subtle functional roles insofar as they are involved in the structure of the thousands of enzymes which make it possible for the body to carry on the chemical processes involved in living; in the use of oxygen without which the body would perish within minutes; in the utilisation of carbohydrate and fat essential for the release of some 2500 to 3000 calories of energy inside the body each day. Proteins are also essential for the maintenance of the circulating pool of 'modified sea water' which we know as the blood. The volume of this fluid is about six litres in the adult, that is to say about 9 per cent of the body weight. The maintenance of this volume at a pressure varying according to the heart beat from 70 to 120mm. of mercury is essential to the body in utilising oxygen and for the dissipation of waste products of cellular metabolism.

The blood volume is maintained largely because of the presence in plasma of a protein, albumin, which has an attraction for water and prevents its escape outside the blood vessels. If the blood volume is reduced by 30 per cent or so because of haemorrhage, or seepage of fluid into the tissues or onto the body surface, blood pressure falls and a state of 'shock' is produced in which the chemical processes in the body begin to fail, including the use of oxygen. Proteins are also involved in fighting off invading organisms, and are components of hormones which the body manufactures to control many body functions.

Body proteins are maintained from ingested proteins contained principally in meat, fish, and some plants such as the legumes. Various sources of proteins differ in their value to the body; the quality of a protein is determined by the presence of some nine or ten particular amino-acids, the essential amino acids. The National Research Council in the United States of America has set a standard of one gram of protein, or 0.16g. of nitrogen, for each kilogram of body weight a day as the optimum intake for a normal person. This amount is perhaps in excess of basic needs in health, but for the sick person who is losing proteins, it is often insufficient. Unfortunately the National Research Council (N.R.C.) standard for normal people has been adopted by most hospitals in their standard dietaries for sick people.

The amount of protein gained or lost by the body is determined experimentally by measuring the nitrogen balance, which is a sort of biological book-keeping where the intake and loss are compared. Nitrogen is used in this accounting because it is the element most characteristic of proteins. Each gram of nitrogen represents some 6.25g. of protein. Nitrogen is lost from the body in the urine, stools, sweat, and hair. The amount lost in sweat is, except in rare instances, usually regarded as constant, and the amounts in hair and nails negligible. It is, therefore, usual in estimating nitrogen balance to take account only of nitrogen in urine and faeces, that in urine being the more important.

In conditions of disease, in computing nitrogen balance, the excessive losses in the urine must be accounted for as a routine. If the amount of nitrogen ingested exceeds that lost the body is said to be in positive nitrogen balance and the inference is that body protein is being gained, each 1g. of nitrogen representing 6.25 of protein, or 25g. of whole tissue taking into consideration the water content. In the reverse situation, that is when loss of nitrogen exceeds the amount ingested, the body is said to be in negative nitrogen balance, and loss of body tissue and weight is to be expected.

Information obtained from nitrogen balance studies must be regarded as circumstantial evidence; it is information without reference to actual body changes, and is, therefore, of limited value and may be misinterpreted. Thus a person suffering a severe degree of protein undernutrition needs relatively little dietary protein to be in positive nitrogen balance, yet this amount may be less protein than his body needs. As protein is accumulated in the body, increasing amounts of protein must be ingested to maintain nitrogen balance; ultimately a stage is reached when no more protein can be retained.

The body can be depleted of protein in a number of ways:

(a) insufficient ingestion of protein in the diet;

(b) intake of insufficient amounts of food so that energy essential to keep the body going is obtained from breakdown of protein needed for other metabolic purposes;

(c) through excessive losses of protein in disease.

Protein losses associated with disease may come about in a number of ways:

(a) The body is thought to react to noxious events by the development of what is called the 'adaptation syndrome' in the first stage of which (the alarm reaction) the body loses excessive amounts of nitrogen. The teleologic argument is that tissue proteins are released into the body fluids in order to provide basic materials for the repair of injured tissues; part of these materials are lost through the kidneys. At this stage the body was thought to be unable to make use of dietary protein for the synthesis of new tissue, but experimental work does not support this. Mobilisation and loss of body protein is thought to be brought about through the influence of hydrocortisone secreted by the suprarenal glands in appreciable amounts during periods of body stress.

(b) Protein is also lost directly in injury and disease. In burns the seepage of tissue fluids from the body surface or into the tissues is often so large that a marked fall in the blood volume is caused leading to shock which is the main cause of death. Proteins are also lost directly whenever there is an appreciable discharge of pus, mucus, saliva, cerebrospinal fluid or when there are marked losses of intestinal juices from the bowel.

(c) Finally, appreciable amounts of protein may be lost through the kidney following their denaturation by physical injury, heat, or bacterial activity.

When protein losses are small and continue over a long period the body may adjust by reducing its mass and conserving normal losses. But when protein losses are appreciable and acute, or when the limits of adjustments are exceeded, the body begins to suffer in several ways. There is loss of weight, anaemia, weakness, low blood pressure; the elasticity of the tissues is impaired, the quality of the nails is changed, and water is retained in the tissues leading to oedema and sometimes, as in kwashiorkor, ascites. There may also be loss of libido, and mental changes. Wounds do not heal, and bed-sores develop. It has been shown that unless a positive nitrogen balance is established bed-sores do not begin to heal. In contrast, administration of pre-digested protein by stomach tube to patients following abdominal surgery prevents loss of weight and helps the patient to recover quickly. Attention to protein requirements in tuberculosis and in cancer can lead to prevention of emaciation and other symptoms usually believed to be characteristic of these conditions. Foods rich in proteins are relatively expensive and hospital administrators are tempted to economise on their use. But if working-man-hours are taken into consideration the amount spent on improving hospital diets would be found to be a profitable investment.

c. Manifestations of malnutrition in man

Certain classical signs of malnutrition are widely recognised, and a number of them were illustrated in the Seminar by means of projection slides. They include cheilosis, tongue changes, abnormalities of the skin, teeth, hair and eyes, rickets and other conditions. It was agreed that some of the signs and symptoms commonly ascribed to specific disease, such as tuberculosis, could be due to associated malnutrition. In the case of infantile beriberi the Seminar concluded that there is much uncertainty of the accuracy of official records of its incidence. This is at least partly due to the difficulty of making an accurate diagnosis, and there is a need for guidance on acceptable diagnostic criteria. An instance was quoted to illustrate the possible confusion between the clinical manifestations of congenital heart disease in the young infant and beriberi.

It was generally agreed that specific signs of malnutrition are not frequently encountered in everyday health practice. This does not mean that inadequate nutrition is not prevalent, but that indices other than the classical clinical signs must be used. Vital statistics may reveal unsatisfactory nutritional standards in a community, and a number of participants gave examples of high infant and toddler mortality rates and a relatively high susceptibility to disease which probably have a basis in malnutrition. It is important for health workers to be fully aware of such manifestations of malnutrition, because they should form the basis for action in improving food consumption to prevent more serious situations which might, indeed, be irremedial. Particular stress was laid on the value of developing an interest, not in manifestations of ill-health, but of good health. Thus health workers should be trained to look for positive signs of health such as physical and mental alertness, good skin colour and texture, and firm muscles.

Special discussion was made of two criteria widely used in public health practice, and of importance particularly because they can be measured in precise ways. These are rate of growth and haemoglobin levels.

i. Growth

Birth weight on the average is directly related to the nutritional status of the mother, and size at birth may determine the plane along which a child will grow. The question of racial differences in birth weights and growth rates was raised, but evidence produced by participants suggested that environmental rather than genetic influences are often present. In one country a comparative study had been made of babies in three distinct racial groups; whilst significant differences were found between certain groups these were due to social grades of the families concerned and not to their race. Furthermore, in another country the size of children has significantly increased during the past ten years or so, a time interval insufficient to allow a genetic factor to exert an effect. Finally, the abrupt change in the growth curve, i.e. a reduced rate of growth, so often found at the age of six months, strongly indicates an environmental influence.

The slowing down of the growth rate at about six months observed in many countries cannot be due to withdrawal from the breast at this age, because in the communities concerned breast-feeding is usually continued for a year or more.

It is unlikely that the mother's milk is at fault, because it is manifestly adequate to support normal growth for the first six months. Therefore, the fault lies in inadequate mixed feeding which should commence at about this time. The need for introducing foods other than milk in the child's diet seems to be generally known, and many instances were quoted by participants of the addition of such foods as egg, vegetables and fruit. However, usually either because of ignorance on the part of the mother, or the non-availability of suitable foods, many infants are not getting an adequate diet after the age of six months.

A number of participants produced evidence that in developing countries children are usually growing on a lower plane than children in more prosperous countries. However, all the records were based on 'cross-sectional' studies in which different children were being measured in different age groups. 'Growth curves' so obtained probably do not give a true impression of what is happening to children in the entire community. For example, they involve usually only those children who attend school; in poor communities many children are not able to go to school, and those who do usually leave at a relatively early age. Thus, the known average heights and weights of older children are probably over-estimates for the entire community because only the richer, and therefore better-nourished would be measured. The poorer children would often be absent from school and might thus not be included in height and weight records, again leading to averages in excess of true ones. An even more serious fault of 'growth curves' as usually presented as a measure of the nutritional status of a community is that malnutrition leads to appreciable loss of life at an early age thus removing from the groups actually measured the most seriously retarded members. For these and other reasons 'longitudinal' studies in which the same individuals are measured periodically over an appreciable length of time are desirable in estimating the nutritional status of a community. Moreover, the studies should particularly involve pre-school children and adolescents - the two groups nearly always left out.

It is often assumed that absolute size is an index of nutritional status. But, for example, the dwarf is not necessarily malnourished; and the true criterion is rate of change in size. Much of the information given in the Seminar showed that school children in various countries are relatively small; but, the slope of their weight gain curves are usually parallel to those of children of well-nourished communities, although on a lower level. It is probable that the reason for this difference is a temporary slowing-up of growth at about the age of six months, and a failure subsequently to make good this setback.

It was emphasised that whilst rate of growth is a most useful index of nutritional status, both for the community and the individual, the quantities involved, namely, about two inches gain in height and about ten per cent gain in weight each year are such that measurements must be made with the greatest care, by sufficiently accurate means, and under standardised conditions, if they are to be meaningful.

ii. Haemoglobin levels

One of the most widespread signs of ill-health is anaemia, and this is often caused solely or partly by defective nutrition. Participants quoted a number of observations in support of this. However it was agreed that

available information is open to question on two grounds, namely, because of ignorance on the part of some observers of normal physiological variations, and perhaps more seriously because of the doubtful accuracy of the usual methods of measurement.

a. Normal standards

The normal haemoglobin level varies according to the subject involved. At birth haemoglobin concentrations are high, but gradually decrease during the first week or so of life. Thereafter, there is a slow steady rise until the commencement of puberty at which time the haemoglobin level of boys increases relatively quickly. After this, at least until old age, the levels remain more or less constant at about 16g./100ml. in men and 13.8g./100ml. in women. During pregnancy haemoglobin levels normally undergo modification, and during the second trimester may fall as low as 10.5g./100ml. It seems probably that failure of health workers to recognise these normal variations often accounts for reporting anaemia where it does not really exist. Whilst it is convenient to bear in mind normal average standards, it is important to know that individual values may normally fall above or below this average within certain limits. Thus in order to assess the presence of anaemia in any individual it is necessary to know not only the normal average but also the lower limits of normal. WHO has defined such limits in a recent publication[1].

b. Methods

The most common method of estimating haemoglobin levels in public health practice is by use of Tallquist blotting paper. It is simple, cheap and widely distributed by UNICEF and other agencies. However, when control tests have been made it has usually been found that Tallquist estimates have been about twenty per cent too low, and individual values have varied widely in either direction from the true values. The Tallquist method can certainly detect the presence of severe anaemia, but in such cases clinical assessment may be just as useful.

The need for an alternative method for use in busy health centres, often situated in remote and primitive situations, was discussed. Attention was drawn to the determination of the blood specific gravity as a measure of haemoglobin concentration. The direct relationship between specific gravity and haemoglobin concentration has been known for a very long time; but has been of particular interest since the last war when, in response to an appeal for an easy and accurate method for application under field conditions, Philipps, Van Slyke and their colleagues elaborated the 'copper sulphate' method[2]. This can be used for whole blood, and provided that solutions are made up accurately, can give estimates of plus or minus five per cent of the true value. If it is possible to separate the serum a combination of whole blood and serum specific gravities can give appreciably more accurate results, and that of serum alone an estimate of serum protein concentration. The stock solution of copper sulphate is best made up in a central laboratory, but appropriate dilutions can be made in the centre where tests are to be made. In practice only one solution is necessary corresponding to the lower limit of normal haemoglobin concentration; by its use normal subjects can be separated

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[1] Ref. Iron Def. Anaemia. WHO Report.

[2] Calculation of haemoglobin from blood specific gravities. J.Biol.Chem. 183, 349.

from the anaemic ones. The latter can then be referred to a hospital or laboratory for further investigation. There are other ways of measuring specific gravity of blood, but that using copper sulphate solutions is now so fully documented and tested that it seems the method of choice. All have the advantage of not requiring a supply of electricity, and do not involve subjective errors due to colour matching and pipetting. Adequate attention must be given to the technique, which, however, can soon be taught to an intelligent worker.

CHAPTER 6

EDUCATION AND TRAINING

a. Condition in which nutrition activities operate

In his speech at the opening ceremony Professor Platt drew attention to "Those who have responsibility for the nutrition of others", and said, "Those of us who are more immediately concerned with individuals can be frustrated and rendered ineffectual if we are not able to work within a framework of a sound co-ordinated food, welfare and educational policy."

The need for co-ordinated food and nutrition policies was emphasised by the Seminar. It was pointed out that those concerned with scientific aspects of nutrition must be aware of, and take into consideration when planning nutrition education programmes for the public, the economic and agricultural limitations which exist in the particular situation concerned. In one country, for example, it was concluded on the basis of dietary enquiries that on the average people needed more eggs in their diet in order to improve their standards of health. Whilst it would have been a comparatively easy matter to spread propaganda on these lines urging housewives to use more eggs in family meals, discussion with agricultural authorities disclosed that the resources of the whole country were quite inadequate to supply the number of eggs required. Such facts must be faced constantly by those concerned with nutrition education of the public, and they must possess a sufficient knowledge of agriculture and national economics. At the same time in order to avoid shortages of essential nutritious foods those who plan economic and agricultural programmes should be guided by the advice of nutritionists.

The Seminar was of the opinion that each country should have a national nutrition committee with representatives from departments of agriculture, health, education, economics, commerce, community development, public works, national defence, and voluntary organisations. Such a national committee might be replicated at provincial and other levels within a country in order to co-ordinate activities influencing food supplies under various local conditions. Each country would formulate a national policy to improve food production, to promote economic expansion, as well as to establish efficient health services.

Discussions in nutrition committees should result in better long-term planning, and consistency between the programmes of various departments. The assistance of an experienced nutritionist engaged in research work is needed in guiding the work of national committees. In addition health departments must have adequate budgets to promote nutrition activities. In many countries, this is not so, and the proportion of the national budget allocated to health is extremely small, even though the welfare of the people is in danger because of hazards to health, perhaps the most widespread being the danger of inadequate nutrition.

The Seminar drew attention to other factors which are important in relation to nutrition and which might be influenced by administrative policies. For example, the minimal size of food packages is often too big to allow purchase by those most in need of the food concerned, and costs of food transport are often too great unless subsidised by governments. Subsidies are also sometimes needed to support co-operative societies through which food is made available to poor members of the community. Much could be done, also, to improve the distribution of food at local, national and international levels.

b. Those who need education and training in nutrition

i. Doctors and health workers

Nutrition should be included in the teaching of medical students, and should include instruction about normal growth and development of children. It is unfortunate that students are usually more interested in disease than in health, and this bias detracts from interest in nutrition. Preoccupation of doctors with urgent clinical problems does not allow them either to get interested in nutrition. Medical students would probably benefit from participation, perhaps during vacations, in dietary and nutrition surveys. They might also be encouraged with benefit to make a special study of particular families so that they could learn about the growth, development and health of individuals in relation to their everyday environment.

Nutrition should be included in the basic training of nurses, midwives and sanitarians. It should be remembered that many of those who attend health centres are too shy to ask questions of the doctors and nurses, but often appeal to ancillary workers. The latter should, therefore, also have some training in nutrition so that they do not mislead the public. All health workers should know enough about agriculture to be able to advise the public on ways of producing foods on a small scale at home.

ii. School teachers

Attention was drawn to the important part that school teachers could take in spreading knowledge about foods and nutrition; adequate nutrition training should be given in teacher training colleges.

iii. The public

Whilst it became obvious during the discussions that the housewife is the chief object of instruction, children are also often involved. Furthermore, it

was pointed out that other members of the family might play a critical role in determining the family diet, and attempts should be made at least to include the father in nutrition education. Actual demonstrations of cooking in which attention is given to such common faults as excessive washing of rice, prolonged cooking, and discarding cooking water which contains dissolved nutrients are of special value. They should be followed up by visits in which advice is given in the home, and availability and costs of foods discussed. The health worker should place emphasis on the use of local products which may be of as much nutritive value as more expensive imported articles. Health workers and housewives usually have little time to spare, so that care should be taken not to devote a disproportionate amount of time to matters of little practical importance. For example, discussion of food taboos and traditional beliefs sometimes take up entire nutrition education sessions, even though they may have little relevance to the immediate objective of bringing about improved dietary habits. Moreover there is a danger that through drawing attention to unsatisfactory habits housewives may be distracted from thinking in more positive terms.

iv. Administrators - politicians, statesmen

"Those who have the responsibility over the nutrition of others."

c. Methods of nutrition education

A good deal of attention was given in the Seminar to visual aids, especially cinematograph films and exhibits. These are the subject of a special description below. The Seminar, however, drew attention to the dangers of placing too much emphasis on such aids which may not always be associated in people's minds with real situations. Furthermore, although many effective mechanical means of trying to disseminate knowledge can be constructed simply and cheaply, the time needed for their operation is often not available. It was generally agreed - especially in view of the urgent situation so often present in many communities - that nutrition education should preferably take place in conditions of everyday life. Thus, as mentioned above, medical students should learn through visiting and studying individual families, and others would benefit from taking part in the actual purchase, kitchen preparation, and preservation of foods.

All nutrition education must be based on scientific knowledge related to local conditions; and nutrition educators must treat members of the public as reasonable and in many ways knowledgeable people. Teachers must first be accepted by the public, and must not only know the facts, but also have a conviction that the task is worth the effort. It is necessary to encourage the public to recognise certain needs, and then get them to do something themselves about meeting them. The aim of nutrition education is to help people achieve satisfactory standards of health through their own efforts. The housewife must often be taught how to budget in a way to allow an adequate purchase of foods; such teaching may usefully commence in curative centres, but should be followed by home visits. When audiovisual aids are used their effectiveness must be checked especially through observations in the home. The use of aids should be preceded by adequate preparation of the group concerned, and they must be devised to suit particular local conditions and for appropriate sections of the public.

d. Special means of nutrition education

i. Cinematograph films

Screening of films was part of the daily programme of the Seminar. Not all of them had been made specifically on nutritional themes, but even those that were primarily of a recreational nature were found to carry messages of use to nutrition educators.

It was generally agreed that visual media render specific and irreplaceable service in nutrition programmes and the film can be the most effective means of conveying a message to the public. A recent UNESCO report "Mass Media in Developing Countries" was discussed and the Seminar agreed with statements in the report that there is great potential educational value in the use of mass media in developing countries where traditional means of education alone prove inadequate; visual aids in general, and films in particular, provide a means of surmounting the barrier of illiteracy. The Seminar thought that educational films might be shown more widely in public cinemas with benefit in many countries. Films are not only of value in nutrition education of the public, but can also be effective in training technical personnel, in 'educating educators', and in influencing decisions of administrators.

Films used in relation to nutrition education should be designed to inform, to motivate and to instruct. Informational films are of a factual, documentary nature and do not attempt to convey specific educational messages. Motivational films encourage, inspire, or recommend a particular course of action without being specific about how the action is to be carried out. They facilitate the acceptance of new ideas or the changing of old attitudes. Educational films attempt to convey knowledge or teach techniques for a specific practical purpose.

Films must be properly used; merely projecting them is not enough, and proper introduction, explanation and subsequent discussion must be associated. Moreover, there are a number of mechanical aspects to be considered. Thus there must be an adequate means of storing films, and technicians must be available to project them and to look after the projectors and screens. Films are sometimes costly, so that a central film library is desirable capable of loaning films, perhaps on an international basis.

An example of a film made on amateur lines was shown in the Seminar and illustrated that sometimes such films can convey useful and realistic information to the public and others, and are comparatively cheap. However, it is advisable when possible to make films with a good deal of careful preparation and expert assistance. It was agreed that it is unprofitable to include too much information into a single film or to attempt to influence too diverse an audience. A film should be made for a specific purpose within the cultural setting of the audience for which it is intended. A single idea, a simple story, slow editing, strong visual images, and the avoidance of tricks, abstractions, complicated animations and graphs, help to increase the utility of a film used for nutrition education purposes. To make a good educational film the Seminar was of the opinion that the full co-operation of personnel from educational, social, technical and health services would be important, and, in the production of films about food and nutrition close co-operation between health and agricultural workers. Such

co-operation would ensure that aspects incidental to the central theme, for example preventive inoculations and handling of babies shown in pictures taken in health centres, would be correct and not misleading.

ii. Exhibits

The kinds of visual and mechanical teaching aids, examples of which were presented to the Seminar, are the flannelgraph, photographs showing educational activities involving the public and technical personnel, film strips, wax and plastic models of foods, actual foods, charts and graphs and literature. In order not to confuse the public an exhibition of educational material should not contain too many items at a time. The Seminar was of the opinion that practical demonstrations are the best means of nutrition education of the public especially when the audience can participate. They concluded that exhibits must be up-to-date, easily understood by those for whom they are intended, of sufficiently large size, colourful, and attractive and when captions are needed these should be brief and helpful.

The Seminar emphasised that the use of educational aids must not occupy too great a proportion of the health worker's time and must not interfere with other work in busy health centres. Care must always be taken to ensure that educational activities are effective in improving everyday habits and standards of health in the community and this means repeated attempts at evaluating programmes, and careful planning. In regard to planning many things have to be considered: space available, location of the exhibition, the surroundings, who is likely to see it, to whom it is to be specially directed and for what purpose. Attention must be given to costs, potential appeal and special interest, and the attractiveness of the exhibit. It is constantly necessary to keep in mind a number of questions. Is the material and message easily understood? Does anything in the exhibition conflict? Are there possibilities for wrong interpretation? Is there provision for further information to support the exhibit? What thought or action is likely to be engendered? What are the possibilities that motivation resulting from the exhibition can be turned to practical action; for example, can the desire to use parboiled rice be fulfilled through its availability on the market? Are frustrations being engendered because of arousing a sense of need which cannot be met in practice? Before an exhibition is displayed to a wider public its acceptance by, and effect on, small selected groups should be tried out and studied, and necessary modifications made. During the time an exhibit is in use adequate provision must be made for its maintenance; and at the conclusion of the display an attempt should be made to find out its effects, both expected and unexpected, and what further activities should be undertaken.

The use of puppets as teaching aids received special consideration in the Seminar. An example of a simple educational play using home-made puppets is given in Annex 8.

ANNEX 1

LIST OF PARTICIPANTS, OBSERVERS, CONSULTANTS, AND SECRETARIAT STAFF

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Miss L. Turnbull*
Regional Nursing Adviser

Mr. J. Milwertz*
Public Information Officer

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* Resource persons

ANNEX 2

LITERATURE DISTRIBUTED TO PARTICIPANTS IN PREPARATION FOR THE SEMINAR

1. Extract from 'Certain biochemical findings in man in relation to diet'.
   A.R.P. Walker.
   Ann.New York Acad.Sci. 1958, 69, 989.

2. Effect of nutrition on pregnancy and lactation.
   C. Gopalan.
   Working paper for FAO/WHO Expert Committee on Nutrition, 1961.

3. Protein malnutrition in man.
   J.C. Waterlow, J. Cravioto & Joan M.L. Stephens.
   Advances in Protein Chemistry 1960, vol.15, p.131.

4. Dry skim milk distribution.
   UNICEF Report, 1959.

5. Extracts from various FAO, WHO and other reports.

6. Nutrition in pregnancy.
   Symposium IV of the Council on Foods and Nutrition of the American Medical Association, 1958.

7. Protein malnutrition in South India.
   K.S. Rao et al.
   Bull.Wld.Hlth.Org. 1959, 20, 603.

8. Nutrition in maternal and infant feeding.
   Panel IV. Fifth International Congress on Nutrition, 1-7 September 1960, Washington D.C.

9. Survey on the needs of children.
   Report on nutrition of children and mothers prepared jointly by FAO and WHO. 21 March 1961.

ANNEX 3

GUIDE FOR PREPARATORY INVESTIGATIONS BY PARTICIPANTS IN THE SEMINAR ON MATERNAL AND CHILD NUTRITION

The following questions should be regarded as a guide to help participants direct their attention to the main problems likely to be discussed in the Seminar; they should not be regarded as exclusive. Participants should make notes of any other problems relevant to food and nutrition which they would like to be discussed.

1. Body weight

   a. How many mothers gain, or lose weight during pregnancy?
   b. What happens to the mother's weight during lactation?
   c. What are the usual birth-weights of infants in your area?
   d. What happens to the infant's weight during the first year of life?
   e. What happens to the infant's weight and height during the first few years of life?

2. Lactation

   a. What is the incidence of artificial feeding of infants?
   b. How many mothers completely or partially fail to lactate?

3. Dietary habits

   a. Are there any food prohibitions in your district in relation to pregnancy, lactation, illness, or other events?
   b. Are any special foods given to mothers during pregnancy or lactation?
   c. What foods are given to infants, and at what ages?
   d. Is there any reliable information about the amount and kind of food consumed in your country?

4. Illness

   a. What illnesses occur in mothers during pregnancy and lactation?
   b. What illnesses occur in infants during the first year of life, and are these related in any way to the method of feeding?
   c. What illnesses occur in children during the first few years of life?
   d. What clearly recognisable dietary deficiency diseases occur?
   e. What is the incidence of toxaemia of pregnancy?

5. Nutrition in public health practice

   a. What methods are used to teach mothers about diet and nutrition?
   b. What difficulties are encountered in trying to teach the public about nutrition?
   c. What are the practical difficulties faced by the public in trying to improve their diet?

d. What are the criteria on which health workers base opinions about states of nutrition, and what determines their decision to hand out diet supplements such as skim milk powder?

Please collect, and bring with you to the Seminar, as much factual information as possible; graphs showing weight changes of individuals, publications based on local observations, pictures of nutritional deficiencies, and the like would be most valuable.

ANNEX 4

TIME-TABLE

Time	Wed.	Thurs.	Fri.	Sat.	Sun.	Mon.	Tues.	Wed.	Thurs.	Fri.	Sat.
	Steering Committee					Steering Committee					
9.00	Opening Ceremony	Country reports	Country reports	Country reports		Country reports	Country reports	Plenary Session	Group Discussions Topic 3	Plenary Session	Group Discussions
10.15	Coffee					Coffee					
10.30	Group photograph Business meeting	Plenary Session	Group Discussions Topic 1	Plenary Session	F r e e	Plenary Session	Group Discussions Topic 2	Plenary Session	Group Discussions	Group Discussions Topic 4 Short Plenary Session	Group Discussions
12.00	Lunch and Exhibits				F r e e	Lunch and Exhibits					
14.00	Plenary Session	Plenary Session	Group Discussions			Plenary Session	Short Plenary Session Group Discussions	Plenary Session	Short Plenary Session Group Discussions	Excursion	Plenary Session and Closing Ceremony
15.15	Tea					Tea					
15.30	Plenary Session Arrangement of exhibits, travel & finance	Plenary Session	Group Discussions			Group Discussions & Plenary Session	Group Discussions	Plenary Session	Plenary Session		
17.00	Films					Films					

ANNEX 5

EXAMPLES OF DAILY BULLETINS

INFORMATION BULLETIN NO. 5

Programme for Thursday, 4 January 1962

8.15 Steering Committee

Plenary Sessions Room 413

9.00 Country Reports:

"Some Observations on Pregnant Mothers and Infants Attended in Health Stations in Taiwan."

- Dr. Peng Jui-jun, CHINA (Taiwan)

"Some Food Habits on Mothers and Children, and Dietary Observation of Children after Weaning in Taichung, Taiwan."

- Dr. T.S. Chen, CHINA (Taiwan)

"Supplementary Food in Infants Observed in Taichung, Taiwan."

- Miss Ao Man-mei, CHINA (Taiwan)

10.15 Coffee

TOPIC I. NUTRITION OF THE HUMAN INFANT

10.30 Session A. Human Milk. Dr. G.R. Wadsworth

Some Observations on the Thiamine Content of Human Milk. Dr. J. Bulatao-Jayme

12.00 Lunch

14.00 Session B. Infant Feeding. Professor B.S. Platt

15.15 Tea

15.30 Session C. Nutrition Education in Relation to Infant Feeding. Miss G.K. Burne.

17.00 Films. Conference Building.

Preparatory Literature:

1. Orientation in infant feeding. P. Gyorgy.
Symposium IV of the Fifth International Congress.

2. Nutrition and lactation. C. Gopalan & Bhavani Belavady.
ibid

3. Culture, social change and infant feeding.
D.B. Jelliffe. Nutrition Document R. 10/Add.27.

4. Certain biochemical findings in man in relation to diet.
A.R.P. Walker. Ann.N.Y. Acad.Sci. 1958. 69, 989.

5. Expert Committee on Maternity Care. WHO Tech. Report Series No. 51
June 1952, p.17, paragraph 6.2.

6. Effect of nutrition on pregnancy and lactation.
C. Gopalan. WHO/NUTR/103, 6 April 1961.

INFORMATION BULLETIN NO. 6

Programme for Friday, 5, and Saturday, 6 January, 1962

Friday:	8.15	Steering Committee	
	9.00	Plenary Session	
		Country Reports:	
		1. West Papua	- Miss D. Bartels Dr. H. den Butter
		2. Vietnam	- Miss Tran-Thi-Phong Dr. Nguyen-Lan-Dinh
		3. Federation of Malaya	- Mrs. G. Paranjothy
	10.15	Coffee	
	10.30	Group discussions on Topic I.	
	12.00	Lunch. Exhibits - Dr. Peng Jui-jun and colleagues. (Library)	
	14.00	Group discussions	
	15.15	Tea	
	15.30	Group discussions	
	17.00	Films. (Conference Hall)	
Saturday:			
	8.15	Steering Committee	
	9.00	Plenary Session	
		Country Reports:	
		1. Republic of Korea	- Dr. Chang Yee Hong Dr. Duk-Jin Yun
		2. Philippines, "Infant Feeding in the Philippines"	- Dr. A. Vergara-Valenzuela
		3. Hongkong	- Dr. Sylvia Chui Chan
	10.15	Coffee	
	10.30	Plenary Session. Group Reports and Discussion.	

GROUP-DISCUSSION GROUPS

GROUP A

Dr. Chen Te-San
Dr. S. Saraswathy
Miss Ao Man-mei
Miss Ng Yew Peck
Dr. Chui Chan
Dr. Chang Yee Hong
Dr. A. Vergara-Valenzuela
Miss Tran-Thi-Phong
Dr. K. Tomabechi
Miss E. Barton

GROUP B

Mr. Meas Khan
Dr. A. Cauret
Dr. Fiafia Tuaua
Dr. Duk-Jin Yun
Mr. Mean Saath
Miss V.P. Easton
Dr. H. Funakawa
Dr. J. Barrios-Balea
Miss G.B. Bartels
Dr. Nguyen-Lan-Dinh
Miss R. Dean

GROUP C

Dr. Maggie Lim
Mrs. G. Paranjothy
Miss L. Cadayona
Dr. Peng Jui-jun
Dr. H. den Butter
Dr. K. Sunagawa
Dr. J. Bulatao-Jayme
Dr. M. Fonacier
Miss L. Turnbull
Mrs. C. Veronilla

Guide for Group Discussion on Infant Nutrition

The following points might be considered, and possibly in the order given:

1. To what extent is artificial feeding being used? Is it increasing in incidence, and is there a changing pattern? That is to say, are human milk substitutes being introduced at an earlier age than heretofor, as in the case of USA, for example, or is the pattern one of a changing proportion of breast-fed and artificially-fed infants at a given age?

2. What are the common types of human milk substitutes being used? Are they adequately labelled so that the public and health workers know their constitution, and are directions on the label clear and accurate?

3. To what extent are the public and health nurses and doctors being influenced by commercial advertising? Do commercial firms exploit the facilities of health centres, for example, by distributing free samples and advertising literature to staff and those who attend clinics?

4. Does any difference of opinion or practice exist between health nurses and doctors in advising mothers about infant feeding? If so, what is the reason?

5. What are the common reasons for mothers failing to breast feed their babies, and according to particular causes, what advice and help is offered to mothers by health workers?

6. What evidence exists that breast-feeding is better than bottle-feeding in the form of mortality and morbidity rates among the respective groups of infants?

7. Mixed feeding. Age at which food other than milk are introduced to the child; the use of local and imported products.

8. The use of herbs, traditional medicine, foods (which may be harmful to the infant if not properly prepared), and teething powder.

Discussion might usefully lead to the following conclusions:

1. What is not known but should be explored; for example, the true incidence of infantile beri-beri.

2. What is known but undesirable; for example, the increasing use of artificial feeding, feeding taboos during lactation, etc.

3. What can be done to remedy these undesirable situations?

ANNEX 6

CONSTITUENTS OF HUMAN COLOSTRUM, TRANSITIONAL AND MATURE MILK COMPARED WITH COW'S MIL
(Average values per 100 ml whole milk)

Constituents	Colostrum 1-5 days	Transitional 6-10 days	Mature after 30 days	Cow's milk
Energy, k/cal.	58	74	71	69
Total solids, g	12.8	13.6	12.4	12.7
Fat, g	2.9	3.6	3.8	3.7
Lactose, g	5.3	6.6	7.0	4.8
Protein, g	2.7	1.6	1.2	3.3
Ash, g	0.33	0.24	0.21	0.72
Minerals				
Calcium, mg	31	34	33	125
Magnesium, mg	4	4	4	12
Potassium, mg	74	64	55	138
Sodium, mg	48	29	15	58
Total electropositive, m-equiv.	5.86	4.93	4.04	13.28
Chlorine, mg	91	54	43	103
Phosphorus, mg	14	17	15	96
Sulphur, mg	22	20	14	30
Total electronegative, m-equiv.	4.75	3.76	2.95	10.55
Excess positive, m-equiv.	1.11	1.17	1.09	2.93
Other minerals				
Iron, mg	0.09	0.04	0.15	0.10
Copper, mg	0.05	0.05	0.04	0.03
Zinc, mg	0.62	0.77	0.53	0.38
Iodine, mg	0.012	0.002	0.007	0.02
Protein distribution				
Casein, g	1.2	0.7	0.4	2.8
Lactalbumin, g		0.8	0.3	0.4
Lactaglobulin, g		0.5	0.2	0.2
Whey protein, g	1.7		0.6	0.6
Vitamins				
Fat-soluble				
Vitamin A, ug	89	88	53	34
Carotenoids, ug	112	38	27	38
Vitamin D, U.S.P. units			0.42	2.36
Vitamin E, mg	1.28	1.32	0.56	0.06
Vitamin K, Dam Glavind units			26	100
Water soluble				
Ascorbic acid, mg	4.4	5.4	4.3	1.6
Biotin, total, ug	0.1	0.4	0.4	3.5
Vitamin B_6 (pyridoxine), ug			11	48
Vitamin B_{12} (cyanocobalmin), ug	0.045	0.036	trace	0.56
Choline, total, mg			9	13
Choline, free, mg			2	4
Folic acid, ug	0.05	0.02	0.18	0.21
Inositol, total, mg			39	13
Inositol, free, mg			44	6
Nicotinic acid, ug	75	175	172	85
Pantothenic acid, ug	183	288	196	350
Riboflavin, total, ug	29.6	33.2	42.6	157.0
Riboflavin, free, ug	19.0	24.0	24.0	
Thiamine, total, ug	15	6	16	42
Thiamine, free, ug	0.4	0.8	4.8	23.0

[1] From (U.S.A.) National Research Council, 1953, Table V.

ANNEX 7

A METHOD OF RELATING PROTEIN REQUIREMENTS AND THE PROTEIN VALUE OF FOOD AND ITS APPLICATION TO THE IMPROVEMENT OF MEALS FOR YOUNG CHILDREN AND THEIR MOTHERS *

It is well knownthat protein-calorie deficiency diseases occur in many of the developing countries and that they are the results of a lack in either the quality or the quantity of the food supplies. Malnutrition in some areas may be improved by supplementing the existing diet with suitable protein foods only, but to attain and maintain a satisfactory state of nutrition for a long period, sufficient energy-producing foods must be available, in proper balance with protein and all other nutrients. Certain groups of people such as toddlers and lactating mothers have special needs, such as a high requirement for good quality protein, and to provide this, there must be sufficient of the right kinds of food available for their meals. Meat or fish, eggs or milk contain protein of good value but either they are not available in adequate amounts, or are not eaten because of religious beliefs and it is therefore necessary to find substitutes for them. This can be achieved by combining foods in such a way that amino acid supplementation takes place and the resulting mixture or meal has a combined protein value equivalent to one of good quality. An example of this can be taken from the middle Eastern countries, where lysine lacking in the wheat flour of the bread is supplied by the bean stew eaten with it.

However, to be successful in combining foods to produce a mixture of protein of better quality than that of any of the individual protein components, the result must be a meal which is nutritionally efficient, economical and acceptable to the various members of the community for whom it is intended. In addition it must be possible to determine or calculate its protein quality so that the value of the complete meal can be related to the requirement of its consumer.

It has long been possible to measure the energy value of food or the energy requirement of an individual as calories but until recently there has been no single term available for the measurement of both the protein value of food and the needs of the consumer.

FAO in its two reports of 1957 (a&b) sets out calorie requirements and protein allowances for different types of individuals in various circumstances and expresses its protein allowances in terms of "reference protein". This can be defined as one which theoretically contains 16% nitrogen and is fully utilised by the body. It is convenient to state this protein allowance in terms of the calories which could be obtained if it were used in the body for energy purposes, expressed as a percentage of the total energy requirements. The FAO recommendation for the toddler's protein and calorie allowance provides an illustration of this.

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*Draft copy from the Human Nutrition Research Unit, National Institute for Medical Research, The Ridgeway, Mill Hill, London, N.W.7. July 1962.

Recommended calorie intake = 1230

Reference protein required = 24g

= 96 Calories (24 x 4)

∴ Daily protein requirement = $\frac{96}{1230} \times \frac{100}{1}$

= 7.8%

7.8% represents the proportion of the daily intake (expressed as calories) which should be supplied by reference protein or its equivalent.

Requirements for other age groups can be expressed in the same manner and are shown in Table 1.

Table 1

Subject	Age (yrs)	k Cals/day	Ref. Protein g/day.	NDpCals %
Infant	0-1			8.0
Toddler	1-2	1230	24	7.8
Child	4-9	1970	29	5.9
Adolescent		3050	64	8.0
Adult		2960	34	4.6
Lactating Mother		3200	76	9.5

The protein value of food, when it is supplied in sufficient amounts to satisfy the consumer's energy needs, is determined by two main factors. These are the quantity of protein present in the food (i.e. concentration) and the quality of that protein.

Quantity is determined from the nitrogen content, which is converted to "conventional protein" by multiplying by 6.25 i.e. assuming conventional protein has a nitrogen content of 16%. Quality is measured by direct or indirect determination of the percentage of the dietary nitrogen which is retained by the consumer, taking into account both its biological value and digestibility. This measurement of the nitrogen retained is the net nitrogen or net protein utilisation (NPU) shown by the following equation.

$$\text{Biological value} = \frac{\text{Retained N}}{\text{Absorbed N}} \times \frac{100}{1}$$

$$\text{Digestibility} = \frac{\text{Absorbed N}}{\text{N intake}} \times \frac{100}{1}$$

$$\text{Net Protein Utilisation} = \text{B.V.} \times \text{D}$$

$$\text{(NPU)} = \frac{\text{Retained N}}{\text{Absorbed N}} \times \frac{\text{Absorbed N}}{\text{N intake}} \times \frac{100}{1}$$

$$= \frac{\text{Retained N}}{\text{N intake}} \times \frac{100}{1}$$

The protein value of the food is obtained from the product quantity x quality, i.e. (N x 6.25) x NPU. The protein value has been called - net dietary-protein value. The calories which could be obtained from the net dietary protein, if it were used as a source of energy, expressed as a percentage of the total metabolisable calories in the food, is called the net dietary-protein calories percentage - NDpCals %. It is the same as the expression used for protein requirement given above -

$\frac{\text{Reference protein Cals.}}{\text{Total energy requirement}} \times \frac{100.}{1}$ The one term, NDpCals %, can therefore be used to express either the protein requirement of a consumer or the protein value of food and so makes it possible to relate the one to the other.

However the protein value of food or its NDpCals % can vary for a number of reasons which may relate to the food itself or the person consuming it.

One cause of malnutrition is underfeeding, in spite of the fact that the food available might appear to be nutritionally balanced. For example, the body meets its energy needs first and if the energy intake is insufficient to meet its energy expenditure, protein is used as a source of energy instead of for anabolism. Where food supplies are short the degree of fall that can be expected in the protein value is seen in Fig. 1, which shows that a diet having an NDpCals = 11% when fed ad libitum to rats, has only one tenth of its value when fed in quantities just sufficient to meet the needs of basal metabolism.

The level of caloric intake is the most important factor in the diet itself affecting the protein value for a given consumer, for it must always be sufficient to balance energy needs with expenditure so that the protein present is available for normal physiological purposes. Other factors in the diet affecting its protein value are the quantity and quality of the protein present and, to a lesser degree, the presence or absence of certain minerals and essential fatty acids.

However, a diet, the same diet, may have a different protein value according to differing factors within the consumer. These factors may be (1) physiological such as growth or lactation, (2) pathological when fevers,

infections or parasites may be present. The effect of malaria, for example, on the protein value has been demonstrated (see Table 2) by feeding isocaloric amounts of the same diet to non-infected and malarious rats. The value was reduced by 50% of that for the normal animal fed ad libitum, but approximately half of this reduction in protein utilisation was due to the poorer appetite of the infected rat and its reduced intake of food.

Similar results have been obtained when the infection was due to hookworm.

Table 2

Showing the impaired Utilization of two Nigerian Diets when fed to Malarious and Pair-fed Rats

Treatment	NDpCals per cent.	
	Kanuri	Otukwang
Unrestricted, Uninfected	8.0	4.2
Malarious	4.3	2.2
Uninfected, Pair-fed	6.0	3.4

Some or all of these factors are to be encountered in the developing countries and they must be taken into consideration when planning the diets or meals for the communities living there. This again emphasises the necessity to calculate the protein value of the food available as it is eaten and to equate the result with the requirements of the individuals within the family groups, who are to consume it.

Quantity measurement of protein

The amount of protein in food is usually determined from the nitrogen content. This is converted into conventional protein by multiplying by 6.25, i.e. assuming that the protein contains 16% nitrogen. The amount of protein can be expressed as calories (instead of grams) by applying a conversion factor (physiological calories obtainable from 1g protein in the body = 4) assuming that all protein is used for energy purposes. Then protein calories %

$$= \frac{(N \times 6.25) \times 4}{\text{Total calories in food eaten}} \times \frac{100}{1}$$

Total Nitrogen present = 0.8g

= 5g protein (N x 6.25)

= 20 calories

Total caloric intake = 200

$\therefore$ P Cals % $= \frac{20}{200} \times \frac{100}{1}$

= 10%

This measurement - P Cals % - is not the same as NDpCals% derived from reference protein because it has not yet been corrected for its quality.

Measurement of protein quality

Two methods can be used:-

(1) Determination of the efficiency of nitrogen utilisation or (2) Calculation on the basis of the amino acid composition in relation to FAO "provisional pattern".

Determination of protein value

This is the measurement of the efficiency of nitrogen utilisation, using the rat assay method (Miller & Bender, 1955) to find the NPU. Using this method the rats are young and because they are rapidly growing and have a high nitrogen demand their retention of nitrogen can be regarded as maximal. They are kept in controlled environmental conditions and are fed, ad libitum, the test meal or diet. At the end of the assay, which is of 10 days duration, the rats are killed and the total amount of retained N in the carcass is estimated. From a knowledge of the amount of N fed and the amount of N retained by the rats, the efficiency of N retention (or NPU) can be calculated by expressing the former as a % of the latter -

$$\text{e.g.} \quad \frac{\text{Retained N}}{\text{Total N intake}} \times \frac{100}{1}$$

$$= \text{NPU}$$

The NDpCals are determined directly, using the product of the PCals% and the NPU.

Calculation of protein value

The quality calculation is based on amino acid composition. If the amino acids/g N are present in quantities at least as much as that recommended by FAO in their "provisional pattern" (FAO 1957a), the score = 100 and can be said to be equivalent to reference protein. If an amino acid is present in less than the recommended amount then the score (or net protein utilisation - NPU) will be proportionately lower.

From a knowledge of the amino acids present in various foodstuffs, it can be seen which of the eight essential amino acids will have the most limiting effect on quality, i.e. which will have the lowest score. In theory each amino acid should be "scored" in turn to determine the one most limiting. However in practice, when scoring meals as eaten, it has been found that it is sufficient to examine for only two in particular (1) Sulphur-containing amino acids (total cystine and methionine), (2) Lysine where the protein source is primarily cereal. Having selected which amino acid is likely to give the lowest score the calculation is made, using information from food composition tables to find the total amount of nitrogen in the food, meal or diet and the total amount of the limiting amino acid present. The Score is determined by expressing the latter as % of what should be present according to the FAO recommendation.

Example: Using total sulphur-containing amino acids (S.A.A.) as the limiting factor:-

Total N present = 3g

Total amount of sulphur-containing amino acids = 0.6g

Amount which should be present according to FAO

$$= 0.27 \times 3g$$

$$\therefore \text{Score} = \frac{0.6}{0.27 \times 3} \times \frac{100}{1}$$

$$= 74\%$$

FAO factor for S.A.A. = 0.27g/g N
Lysine = 0.27g/g N

Investigations made in this Unit have shown that of all the foods, meals or diets tested, 75-80% of them have their protein quality limited by the same amino acids, namely those containing sulphur (i.e. cystine and methionine), in spite of the fact that most cereals by themselves are deficient in lysine. However, as foods are not normally eaten alone but in combination with others, as in a meal, it must be the total amino acid content of the whole meal that is considered for "scoring".

The calculated chemical score equals the NPU only when the level of the protein in the meal or diet is low. If the diet consists of a meal e.g. one ordinarily eaten by man - freeze dried, to avoid heat damage and powdered to prevent any preferential food selection by the rat - its protein concentration is higher than under standard conditions and because the body in these circumstances uses protein, not only for anabolism but also for energy, the efficiency of nitrogen retention is reduced and the Net Protein Utilisation is lower than the chemical score. As the protein concentration increases so does its Net Protein Utilisation fall. This fall is allowed for in the construction of the nomograph, which corrects for it (Miller & Payne 1960) in calculating the Net Dietary Protein Calories % (NDpCals %) (see Fig.2).

To find the NDpCals % of a diet of calculated score of 75, fed at 10% concentration, take the left vertical axis of the nomograph and find the line for a diet having a score of 75. On the lower horizontal axis find the line for a diet having a P Cals % of 10. The point where these two lines meet cuts a parabola, in this case exactly on the parabola labelled 7. Therefore the NDpCals % = 7. Similarly for a diet with a score of 60 and p Cals % 15, the horizontal line from score 60 cuts the vertical line from P Cals % 10 at a point between parabolas 7 and 8. The NDpCals % therefore lies between these 2 points at 7.4%. Similarly a diet with a score of 55 and P Cals % of 25 would have lines meeting at a point between parabolas 8 and 9 and its NDpCals % = 8.7.

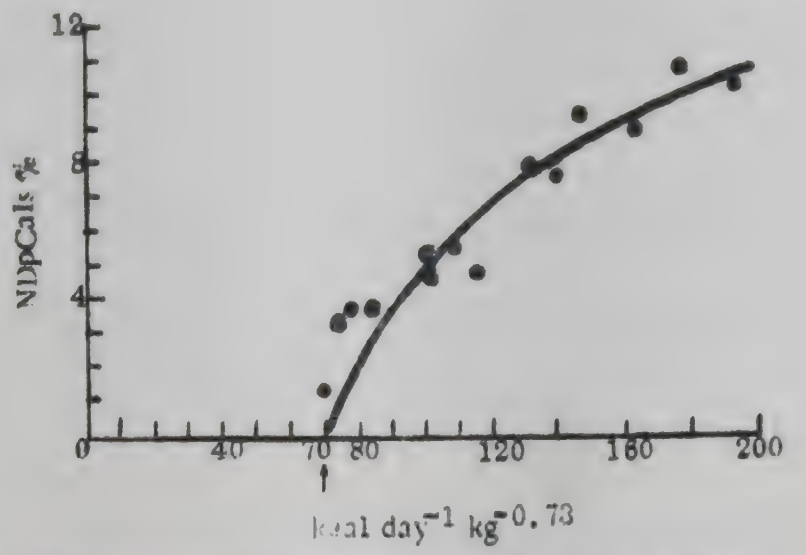

Fig. 1. The net dietary-protein value (NDpCals %) of diets fed at various levels of restriction. (Data derived from six diets; Miller & Payne 1961.) ↑ shows basal metabolism.

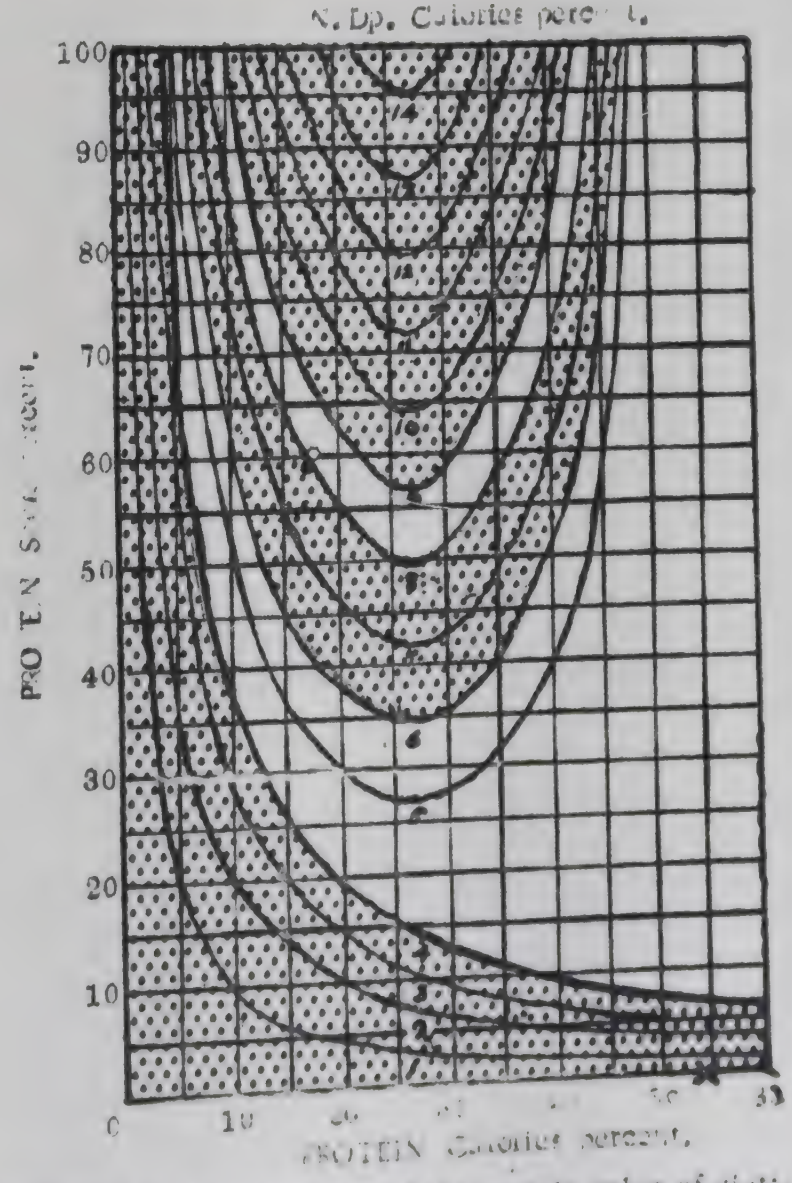

Fig. 2. Nomograph for the prediction of the protein value of diets. The parabolas are lines of equal NDpCals %.

If the nomograph is studied further, it will be seen (1) that if the P Cals are increased beyond 27.0% at the same score then protein quality, NDpCals %, begins to fall, the reason being that more and more protein is being metabolised for heat and energy, and this from an economic view too, is an expensive form of calories.

(2) If the "Score" is less than 50, it is not possible to obtain an NDpCals % of 8.

(3) Similarly if the P Cals % is less than 9, it is not possible to obtain an NDpCals % of 8, even though the score is 100. There are several methods of improving the NDpCals % of any meal but they fall mainly into two categories.

I. Improving the quantity or percentage of the protein calories present.

This may be done by -

(a) adding more of an ingredient already present and supplying protein e.g. beans, fish or meat.

(b) introducing another food, available locally, which contains a reasonable quantity of protein.

(c) reducing an ingredient such as oil, fat, alcohol or sugar which contribute calories only.

II. Improving the protein quality of the mixture by -

(a) substituting some of the existing staple with another local staple richer in the limiting factor e.g. replace cassava with wheat, maize or rice.

(b) adding another food with a greater concentration of the limiting factor e.g. sesame seed, egg, fish.

These additions may or may not appreciably increase the protein concentration, but they frequently do. One or more foods may be added together (see Tables 3 and 4).

To put this knowledge to more practical purpose it must now be applied to meals as they are actually eaten so that the foods used in their preparation are combined in quantities which allow their optimum nutritive value to be utilised by the consumer.

In this project it has been applied mainly to the improvement of meals for the toddler age group, whose requirement for protein of good quality is high. Nevertheless, it has not been forgotten that protein needs in the latter part of pregnancy and during lactation are even higher and it is hoped that the principles employed in improving meals for one age group can be applied easily to another.

Table 3

Example of "Scoring" a meal

DIET: Dinner (Malayan - Chinese)

BASIS of Score : Total sulphur containing amino acids (S.A.A.)

Weight a	Food	% P b	% Cals c	AA/g N d	Ng e	Cals f	AA g g
					$\frac{axb}{6.25x100}$	$\frac{ac}{100}$ or (dxe)	$d\frac{ab}{625}$
20 g	minced fatty pork	8	554	0.22	0.25	109	0.05
25 g (wet weight)	dried cabbage	3	26	0.12	0.01	6	0.00
80 g	long green beans	2	30	0.12	0.26	24	0.03
10 g	fat (lard)	-	891	-	-	89	-
160 g	rice	7	349	0.19	1.79	558	0.34
Totals in Meal		-	-	-	2.31	786	0.42
					e	f	g

Quantity Factor

$$\text{Protein Cals \%} = \frac{e}{f} \times \frac{6.25 \times 4}{1} \times \frac{100}{1} = \frac{2.31 \times 6.25 \times 4}{786} \times \frac{100}{1} = 7.3\%$$

$$\frac{\text{Quality Factor}}{\text{Score}} = \frac{g}{e} \times \frac{100}{\text{F.A.O. factor for S.A.A.}} = \frac{0.42}{2.31 \times 0.27} \times \frac{100}{1} = 67\%$$

NDpCals = 5
(Read from nomograph)

Notes:

1. b & c are percentages taken from Food Composition Tables.
2. d is the amount of the limiting amino acid present per gram of N in each ingredient.
3. e, f, g, are the total amounts present in each ingredient.
4. This meal, if fed in sufficient quantity, would be suitable for an adult.

Table 4

DIET: Improved dinner (Malayan - Chinese)

BASIS of Score : S.A.A.

Weight	Food	% P	% Cals	AA/g N	Ng	Cals	AA g
a		b	c	d	$\frac{ab}{625}$ e	$\frac{ac}{100}$ f	$d\frac{ab}{625}$ g
30 g	minced fatty pork	8	554	0.22	0.38	166	0.08
30 g (wet weight)	dried cabbage	3	26	0.12	0.12	8	0.02
90 g	long green beans	2	30	0.12	0.29	27	0.03
10 g	fat	-	891	-	-	89	-
160 g	rice	7	349	0.19	1.79	558	0.34
50 g	salted egg	13	153	0.34	1.04	77	0.35
40 g	soybean	35	382	0.20	2.24	153	0.45
Totals in meal		-	-	-	5.88	1078	1.27
					e	f	g

$$\frac{\text{Quantity Factor}}{\text{Protein Cals \%}} = \frac{e.\ 2500}{f} = \frac{5.88 \times 6.25 \times 4}{1078} \times \frac{100}{1} = 13.6\%$$

$$\frac{\text{Quality Factor}}{\text{Score}} = \frac{g}{e} \times \frac{100}{\text{F.A.O.}} = \frac{1.27}{5.88 \times 0.27} \times \frac{100}{1} = 80$$

NDpCals % (from nomograph) = 9

Note:

(a) If fed in sufficient quantity, the meal is now suitable for advanced pregnancy or lactation.
(b) If the soybean was not used the NDpCals % of the meal would still be suitable for a toddler.

Preparation of meals is essentially a practical task and throughout the world it is executed under very varying conditions. Consequently scientifically accurate results cannot always be expected but the aim should be to produce meals whose calorie content and NDpCals % come as closely as possible within the range recommended.

The following collection of recipes for traditional snacks or meals belong to the developing countries and have been gathered together from different sources. In many cases the actual ingredients remain unchanged but the quantity of them has been modified to suit this particular project. Whenever a modification was necessary, the new version of the recipe has been prepared and offered, where possible, to someone already familiar with the basic recipe, for approval of the flavour, texture, appearance and, if applicable, the suitability for the age group for whom the recipe was intended. Meals prepared from a number of the recipes have also been fed to rats to confirm by biological assay the calculated NDpCals %.

The weight of each ingredient has been given, because this was essential in order to "score" the recipe. It is realised, however, that in practice scales are not always available for weighing, but some measure which is cheap and easily procurable in the locality could be used to convert as accurately as possible, the quantitative weight into a qualitative measure. A cigarette tin, for example could be adopted for this purpose.

The methods of preparation described may be representative of one particular area only, but the same ingredients if used in exactly the same quantities, would still have the same protein value if a different method was employed to satisfy the tastes of another community. Some care, however must be taken when altering a method for preparation or for cooking to ensure that no additional foods such as fats, oils or sugar are incorporated into the original recipe. Additions of these would alter the concentration of protein in the meal or dish and consequently the protein value of it. This limitation does not apply to small quantities of tomatoes, green leafy vegetables or some fruits, none of which would make an appreciable difference to the quality of the final product. Protein value is also reduced when a mixture of ingredients is subjected to a high temperature, as in the baking of a dough for biscuits or rusks, because the browning process causes some denaturation of the protein. The same ingredients would have better value if cooked as a bread, where browning in the dough is lower, or as a porridge or gruel.

Because protein-calorie deficiencies affect mainly very young children, most recipes are designed to provide their requirement of protein. However, as mentioned earlier, the protein value is only effective if the meal is fed to children in quantities which will satisfy their calorie requirements. For this reason the calorie value of each recipe is given, so that an estimation can be made of the quantity which will be necessary to provide a meal of adequate calorie content for the child.

Throughout, the protein quality of the snacks or meals has been emphasised, but it has not been forgotten that minerals and vitamins also are important constituents of the daily dietary intake. Therefore in addition to teaching people how to produce more nutritious meals from their own local foods, encouragement should also be given for the use of as wide a variety of them as is possible to procure.

Mothers should be taught that young children develop the taste for various flavours only when given opportunities to do so. Sugar, spices, hot seasonings and quantities of oil are not necessary to make meals palatable for their offspring. Sugar and oil, except red palm oil, which contains vitamin A, supply calories only, and when extra calories are required it is more beneficial to provide them instead with an increased proportion of the meal as a whole. Where appropriate, the child's portion could be served from the family pot before the final seasonings for adults are added. If gruels or paps are to be given, the amount of fluid used in their preparation should be limited, so that the final product is in a quantity suitable for the capacity of the child's stomach. Satisfactory standards for the nutrition of the community having once been established, can only be maintained if they are accompanied by similar standards for hygiene, particularly in the handling and storage of food. It is therefore essential that the elementary rules for good hygiene should be incorporated into the education necessary for the attainment of an optimum nutritional state.

In addition to the conventional recipes a guide is given in Table 5 to show the calculated minimum quantity of some protein foods required to increase the NDpCals of different staples to approximately 8%. The protein quality has been calculated from edible portions of food and the calorie value for each mixture is given. It will be noted that for many staples relatively larger amounts of pulse than proteins from an animal source are required to produce the desired NDpCals and that apart from wheat and oats, no staple can be improved sufficiently with groundnuts alone. Because of the effect of amino acid supplementation, it cannot be assumed that the same NDpCals will be obtained if half the required amount of one protein food in a mixture is replaced by the appropriate weight of another. If the mixture is already limited by the total sulphur containing amino acids present, little improvement can be expected by adding a pulse which is also deficient in the same amino acids. The improvement in the protein value in such a case can only result from an increase in quantity or concentration of protein and this may or may not offset the reduction in protein quality. The potential value of an untried recipe may be assessed by comparing the proportion of staple food to protein in the ingredients with the basic proportions given in the table, but due caution must be exercised in drawing conclusions as the minimum amount only for each protein food is given and the expected value would not apply in the presence of fat, oils, starch or sugar. Some of the basic mixtures are suitable to serve alone as a gruel to very young children but others could be improved in flavour by the addition of small amounts of tomato, green leafy vegetable or some fruit.

These recommendations have been prepared primarily for doctors, nutritionists, dietitians and others to interpret for the use of people living in areas where malnutrition occurs and the aim has been to provide basic principles, which can be adapted to suit any local food supply, as well as the religious and social customs. The recipes are a demonstration of their practicability and serve as models to which more examples can be added. It is known that it is neither possible to grow the same types of food in all areas, nor desirable, as consideration should be given to local tastes, but it is possible to use the same principles in any one area to improve the nutritional value of the meals, with sufficient flexibility to enable portions to be adjusted to the differing physiological needs of the individual members, when the food is being distributed within the family group.

Table 5

Calculated minimum quantity of some protein-rich foods required to increase the NDpCals of a given quantity of staple to 8% (approx.)

100g Staple	+ Eggs No.	+ Meat g	+ Fish g	+ SMP g	+ Soybean g	+ Average pulse g	+ Ground nut g
Wheat	0.4 343	9 329	7 323	4 330	5 335	7.5 338	10 372
Rice	0.5 390	27.5 392	20 372	20 424	40 504	N.P.	N.P.
Maize	0.6 388	30 385	20 361	15 396	25 437	N.P.	N.P
Millet (Pen-nisetum)	0.6 407	17.5 390	12.5 377	6 386	10 403	60 549	N.P.
Sorghum	0.6 406	27.5 396	17.5 373	12.5 401	22 440	N.P.	N.P.

This table is not yet completed.

otes

_____ : represents calories provided by the mixture.

M.P : represents skimmed milk powder.

P. : indicates that an NDpCals 8% is not possible.

gs : 1 standard egg in shell weighs 60g.
1 " " without shell weighs 50g.
If dried egg replaces fresh egg, divide quantity given by 4.

sh : Figures for a good white fish were used. If dried fish replaces fresh fish, divided quantity given by 3.

at : Figures used for an average lean meat.

lse : Figures represent average pulses and exclude any containing a high % of oil (e.g. groundnuts) and also soy bean.

Analysis figures selected for use in calculations

FOOD	Protein %	Calories %	Limiting Amino Acids	
			Total S.A.A. /g^N	Lysine /g^N
Egg	13	153	0.34	0.37
Meat	16	145	0.22	0.54
Fish	19	98	0.24	0.54
S.M.P.	35.6	360	0.23	0.50
Soybean	35	382	0.19	0.40
Average pulse	24	306	0.12	0.45
Ground nuts	23	555	0.12	0.45
Wheat	11.5	316	0.20	0.13
Rice	7.5	352	0.20	0.16
Maize	9.5	342	0.16	0.12
Millet (Pennisetum)	11	365	0.18	0.13
Sorghum	9.5	356	0.17	0.12

Abbreviations used

1 tspn	=	1 teaspoon	1 pt	=	1 pint (20 ozs)
1 tbspn	=	1 tablespoon	1 qt	=	1 quart (40 ozs)
1 g	=	1 gram			
1 kg	=	1 kilogram			
1 oz	=	1 ounce			
1 lb	=	1 pound			

A.P.	=	As purchased
E.P.	=	Edible portions

Equivalent weights and measures

30 g	=	1 oz	1 oz	=	30 g
1 kg	=	2.2 lbs	1 lb	=	0.45 kg
1 litre	=	1.8 pts	1 pt	=	0.56 litre

Liquid measures

12 tablespoons	=	1 cup
1 cup	=	8 ozs
2-1/2 cups	=	Imperial pint

Dry measures

Dry food may be measured or it may be weighed. Small amounts of dry food may be measured with spoons, but larger amounts are more satisfactorily measured in a cup or its equivalent. All measures given are level.

3 tspns	=	1 tbspn
16 tbspns (dry)	=	1 cup

A list giving the weights and their equivalent measure of the most commonly used foods is in process of preparation.

Bean Stew

Beans (vicia faba)	60 g.
Lentils (lens esculenta)	10 g.
Oil	
Lemon juice	
Salt to season	
Tomato (1)	60 g.
Lettuce leaves	30 g. (approx).
Whole wheat flour (for bread)	100 g.

1. Soak beans for several hours, then change the water.
2. Add washed lentils and bring to the boil.
3. Cook gently until very soft and little water is left.
4. Season with salt, oil and lemon juice.
5. Make bread from wheat flour.
6. Serve beans and bread with the lettuce and tomato.

NDpCals = 8% Cals in Mix 623

(Egypt)

Millet Soup (Sagbarigu)

Millet (pennisetum) flour	75 g.
Powdered white fish	5 g.
Water	1/2 pt. (approx).
Salt to taste	
Tomato (1)	60 g.

1. Put water in saucepan to boil.
2. Add salt.
3. Add powdered fish and simmer for some time.
4. Add flour and stir well.
5. Simmer 30 mins.
6. Serve cold with the tomato.

NDpCals = 8% Cals in Mix 292

(Africa)

Sorghum Soup (Sagbarigu)

Sorghum flour	75 g.
Powdered white fish	10 g.
Water	1/2 pt. (approx).
Salt to taste	
Tomato (1)	60 g.

1. Put some water in saucepan to boil.
2. Add salt.
3. Add powdered fish and simmer for some time.
4. Add flour and stir well.
5. Simmer 30 mins.
6. Serve cold with tomato.

NDpCals % = 8.2 Cals in Mix 314

(Africa)

Maize Porridge

Maize flour	100 g.
Skimmed milk powder	20 g.
Water	1/2 pt.
Sugar	20 g.

1. Put maize flour and S.M.P. in a saucepan.
2. Mix to a smooth paste with some water.
3. Add remainder of water and bring to the boil.
4. Cook gently for 45 mins. with constant stirring.
5. Add sugar for flavouring and salt if desired.

NDpCals % = 8 Cals in Mix 460

(Africa)

Dhal Masoor and Chapatti

Red lentils (lens esculenta)	450 g.
Water	3 pts.
Salt	15 g.
Onion (finely cut)	30 g.
Butter or ghee	30 g.
Lemon juice (as available)	1/2 lemon
Whole wheat flour for Chapatti	660 g.

Seasonings:
Turmeric
Chile powder
Zera seeds

1. Wash lentils well in cold water.
2. Add 2 pts. water, salt, turmeric and chile pdr. and bring to boil.
3. Simmer 20-30 mins.
4. Stir well, add another 1 pt. water.
5. Cook further 15-20 mins.
6. Melt butter, add onion and zera seeds and fry gently till almost cooked.
7. Add onion and zera to soup.
8. Lastly add lemon juice.
9. Serve with chapatti made from whole wheat flour.

NDpCals % = 8 Cals in Mix 3718

(India/Pakistan)

Gruel

Red lentils	100 g.
Water	1-1/2 pts.
Semolina	100 g.
Sugar	10 g.

1. Bring water to boil and add well washed lentils.
2. Simmer gently with the lid on for 15-20 mins.
3. Mix semolina and sugar to a smooth paste with approx. 1 cup water (8 ozs).
4. Stir mixture into the partially cooked lentils.
5. Continue simmering for a further 15 mins.
6. Serve.

NDpCals % = 7.6 Cals in Mix 682

(India/Pakistan)

Gruel

Whole wheat flour	20 g.
Bean flour (P. Vulgaris)	10 g.
Sesame seeds (or ground)	10 g.
Salt if desired	
Water to mix	1/2 pt. (approx).

1. Put dry ingredients in saucepan.
2. Mix to a smooth paste with some of the water.
3. Stir in remainder of water.
4. Bring to the boil, stirring all the time.
5. Cook gently for 4-5 mins.
6. Pour into bowl or dish and serve.

NDpCals % = 8.5 Cals in Mix 158

These ingredients can also be made into a yeast bread.

(Turkey)

"Tutu" Beans

Water for beans	60 g.
Black beans (P. Vulgaris)	
Salt to flavour	
"Louro" leaf	
Cassava flour	20 g.
Beef	30 g.
Fat for frying	10 g.

1. Soak the beans and discard water.
2. Boil beans, with fresh water, with "louro" leaf and salt until soft.
3. Add cassava flour and continue cooking until it looks like brown porridge.
4. Fry meat in the fat.
5. Serve with the beans.

NDpCals % = 8 Cals in Mix 394

(Brazil)

Fried Black Beans + Cheese

Beans (P. Vulgaris)	75 g.
Water	
Salt to taste	
Lard	15 g.
Rice	60 g.
Soft cheese	30 g.

1. Clean and wash the beans.
2. Add water and salt and bring to the boil.
3. Boil gently until liquid has thickened and nearly boiled away.
4. Pound to a smooth paste.
5. Add the lard and cook slowly in frying pan until the beans have become a firm paste.
6. Serve with the rice, well washed and cooked in the usual way, and the cheese.

A little onion and amaranthus may be used for extra flavour.

NDpCals % = 7.9 Cals in Mix 653

(Guatemala)

ANNEX 8

THE USE OF PUPPETS IN NUTRITION AND HEALTH EDUCATION

Shadow-puppets require no elaborate material; anything available such as the frame of a door, a table, a couple of broom handles and a pair of chairs are suitable for the main equipment. Stiff paper or cotton material stretched firmly upon a frame provides the surface upon which the shadows appear. The puppets are designed simply and cut out of cardboard or stiff paper. The separate pieces forming the whole figure are loosely jointed to allow expressive movement of the body and limbs, especially the hands. The silhouettes of the figures are cast upon the screen by means of a light at the back of the screen in front of which the audience sits. Atmosphere is modified by changing the colour or intensity of the back lighting and by accompanying music and sounds.

An example of a play devised for use among fishing communities in Hong Kong is as follows:

PEACH BLOSSOM LAND

CHARACTERS -

Ah Peng - a fisherman.
Ah Cheng - a fisherman's wife (with Baby Jai on her back).
Ah Saam - a fisherman's son.
Lo Wong - Village Elder.
Ah Li - Village Elder's daughter.

SCENE 1

Outside the humble home of the fisherman sits Ah Saam, the son. He is miserable. His head and hands hang down. The scene is one of poverty and general untidiness.

Ah Peng, the fisherman, enters slowly and surveys his dejected, downcast son. Shaking his head wearily he laments, "If only I had a son, strong, like the one I hoped for - quick of the eye, sound in both mind and limb - a helpmate to catch fish. Alas, it is too obvious for all to see. I have only a weakling of a boy. My poor wife has burnt joss-sticks and spent hard-earned money at the temple, all to no avail. Ill luck surely dogs us."

The fisherman peers into the food-pot, (or rice bin). "Ai ya, there is little food left. There will be still less now Baby Jai has arrived, with another mouth to feed. What comfort am I to expect in my old age? But there, the future I cannot foretell - I must consider the miserable present." He inspects the fishing tackle lying around, and observes - "These nets require mending. My wife should do such jobs. Alas, she is away all day, trying to earn a few cents for food." Straightening his back and carefully scanning the horizon

he sighs, "The weather is as dreary as I feel. There is worse to come - the horizon grows black. Dark clouds are collecting in the East." I will take the sampan westward to fresh waters. 'Tis best I go before the tide turns.

Picking up fishing gear, he goes.

The boy sits on, with little or no comment or movement. Pause.

The fisherman's sampan may be seen sailing across the skyline, westward. The boy raises his head and watches sadly remarking, "My good father labours long and hard. I wish I were like the fine son he dreams of, instead of the poor sick thing that I am!

Here the boy can continue to speak of his symptoms of a disease, it is thought necessary to bring attention to e.g. T.B. he can cough, etc.

Ah Cheng, the fisherman's wife enters with Baby Jai strapped firmly to her back. She carries a bundle of fuel (grass or sticks - whichever is burnt in the area). Placing her burden down she laments. "How tired I am." Then looking anxiously at her son, she asks, "Ah Saam, where is your father?".

Boy - "Mother, my father has gone fishing before the tide turns."

Local signs of the storm approaching will be introduced. Stage effects can have full scope.

Mother - "It is said, a storm approaches. There is danger in the air, listen to the thunder. "Ai ya, ai ya, the wind grows fierce."

Mother and son get close together showing fear.

CURTAIN falls - to the sound of storm crescendo.

SCENE 2

A pleasant scene bright with sunshine and blossom. In every way a contrast to Scene 1. Ah Peng, our fisherman lies sleeping peacefully.

Sound of bird-song.

Enter Ah Li, the village elder's daughter. She is light of foot and happily singing as she gathers flowers. Seeing the sleeping figure, she stops, then cautiously approaches and prods Ah Peng.

He stirs, rubs eyes, stretches his limbs and surveys the pleasant scene - "Goodness me, I thought it was a dream! Where am I? Who are you?"

"But first Sir, what is your honourable name?"

"I am Peng a humble fisherman," he explains. "Blown off my course by a great storm. Finding shelter in a strange cave, I secured my old boat, walked a while in search of food, grew weary and must have fallen asleep and here I am."

Ah Li tells him, "This is Peach Blossom Land, I am Ah Li, the daughter of the Elder of our village."

She first shows pity for his suffering, and then her excitement grows at having discovered a stranger. Quickly her mood turn to one of helpfulness.

"You are hungry?"

"Indeed I am." (Ah Peng shows just how)

Laugh develops here.

"You must eat."

"I have no greater desire."

"Then we will go to my father's house."

She helps Ah Peng up and merrily leads him away.

Bird-song again.

CURTAIN.

SCENE 3

Environs of a most pleasant dwelling are portrayed. (A moon gate or porch with red pillars and perhaps a suspended Chinese lantern).

Bird-song continues.

Ah Li's voice can be heard coming nearer and excitedly calling his father. She is breathlessly describing the man she has found.

Good opportunity for comic.

Ah Wong, her father, a stately gentleman appears. He looks puzzled and ponderously strokes his wisp of a beard. "My young daughter has found a man (etc.). He is hungry, etc.?"

Ah Li enters from the opposite side, leading or gently pushing Ah Peng whose courage is fast failing.

"My clothes are too shabby to meet such an important gentleman. Let us wait until the New Year when I may have a new suit." Ah Li reminds him, "It is you who are hungry, my father is not. Even if he were, I doubt he would eat you."

Ah Wong, "Welcome stranger to Peach Blossom Land."

Greetings are correctly exchanged. Ah Peng is invited to rest and drink tea. Ah Li serves the tea and says she will be away to help prepare a meal.

Ah Li may seek advice from the audience as to what to prepare. Food customs can be checked.

The men talk, (topical interest may be introduced).

Ah Li brings a basin and Ah Peng washes his hands.

Hints on hygiene and nutrition suggested.

The men continue to talk.

Later, Ah Li arrives with bowls of food. Ah Peng eats with relish and suitable praises.

She may ask what their guest must do before eating, i.e. wash hands.

Ah Wong can the while elaborate on the importance of a balanced diet for health and long life, (or any other teaching point desired).

Ah Li serves Ah Peng with more food. Ah Peng admires the beauty of Ah Li. "Sir, your daughter is very lovely. Such beautiful eyes - brows as delicate as a moth's antennae - face like a full moon - figure like a swaying willow tree. And of her complexion - it is as fair as your peach blossom."

Depending on her talents Ah Li can sing, dance or do acrobatics for the guest's pleasure.

Ah Wong receives the praises modestly, and explains the reasons for his daughter's health and beauty.

Ah Peng now replets, pays tribute to the meal and also the orderliness of the surroundings.

Any point can be emphasized e.g. fresh air, enough sleep, etc.

Ah Wong explains the virtues of combined effort in achieving this - not only of the family but the whole village - in maintaining cleanliness. "Health is the concern of all, therefore, the paths that lead to health are the concern of all."

Again, any special theme can be developed. The audience can be included if required.

Ah Peng throws his head back and breathes deeply the good air. He rejoices, "I feel fine - my heart is new and strong. Many things I have learnt today. There is much to be done - first in my home and then in our village. Why didn't I realize the importance of these things before? No further time must be lost - I will return to my home."

Farewells are expressed and Ah Peng takes his leave.

Father and daughter watch the sampan sailing away, (in the direction from where it came).

CURTAIN.

SCENE 4

Back to Scene 1.

Mother and son are lamenting the sad loss of Ah Peng. "Sharks (or dragons) will have eaten him. How are we to survive."

The sound of merry whistling can be heard approaching.

The two listen.

Ah Cheng, "It sounds like your father's whistle."

Ah Cheng may appeal to the audience who will enjoy reassuring her.

Ah Saam, "I never heard him so merry."

Ah Cheng, "Perhaps it's his spirit."

Ah Peng enters with a large fish.

Ah Cheng, "Husband, are you in flesh?"

Ah Peng, "Indeed I am, dear wife."

Ah Saam, "Is the fish real?"

Ah Peng, "That you will taste for yourself while I tell you of my wonderful adventure."

Ah Cheng, "You have brought new hope?"

The lights can grow gradually brighter.

Ah Peng, "More than that."

Ah Saam, "The big fish?"

Ah Peng, "And even more."

Ah Cheng, "What?"

Ah Peng, "Resolution for action. First we must get our home in order."

Ah Peng carefully goes through a number of points - with the assistance of the audience.

Restrict the points to the theme you have chosen or the present needs and interest of your audience. Repetition may be advisable.

Where possible the family takes immediate action and the scene improves, e.g. "The damp comes in, this roof needs mending." Mend it.

Here is a tin of old water. It has "Wrigglers." What must I do?" (Audience obliges).

In turn they sweep the floor, dispose of rubbish, store water properly, cover the food and so on - to the satisfaction of all.

The audience is praised for wisdom and co-operation.

The play concludes on a happy purposeful note.

CURTAIN.

ANNEX 9

BIBLIOGRAPHY

A number of publications are issued from time to time by the World Health Organization. The monographs are obtainable from local agents or WHO, Geneva, and must be purchased. The WHO Bulletin, Technical Report Series, and World Health, are distributed regularly to every government in the Region. If further copies are required by official departments within a country, application should be made to the Medical Department or Health Ministry. The latter can then send an appropriate request to the Regional Director, WHO Western Pacific Regional Office. The receipt of such requests is encouraged by WHO.

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